

TTPM3 Printer/Encoder

Technical Manual



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1 INTRODUCTION

This document describes installation and operation of TTPM3 Ticket Printer/Encoder, which creates credit-card-wide tickets with magnetic encoding and thermal printing.

1.1 Document printing

TTPM3 uses the direct thermal printing technique and can print the entire surface of the ticket with text, bar codes, or graphics, or any combination hereof. Text block position and orientation is software programmable as is the character size.

The data sent to the printer is converted to a ticket image which is stored in the unit until an "All Clear" software command is sent, or the power is turned off/on.

1.2 Magnetic encoding

Three magnetic tracks can be encoded: Either with standard low coercivity recording, or optional "household-magnet proof" high coercivity recording.

ISO track version¹: ISO track 1 at 210 BPI
 ISO track 2 at 75 BPI (Bits-Per-Inch)
 ISO track 3 at 210 BPI

Center track version: 7 mm wide center track at 75 or 210 BPI

The TTPM3 can be used for encoding on one, two, or three tracks simultaneously.

Read-after-write is automatically performed.

You can also enter an already encoded ticket into the TTPM3 and read the magnetic stripe and output the data to the host computer.

See also "Magnetic encoding- and decoding-related commands" on page 42.

1.3 Document handling

TTPM3 printer has two rear inputs for ticket stock. Both can take continuous ticket stock like fanfold or roll ticket material. You can configure the printer so that one is used for continuous stock and the other is used for handfed tickets.

There is an optional front load mechanism that makes it possible to load single tickets through the ticket exit. This replaces the upper ticket entry at the rear of the printer. In addition to this, the front load has a wastebasket function for redirecting used or invalid tickets to a wastebasket, thus preventing useless tickets being presented to the customer.

You can select to partially eject the ticket so that the customer takes it from the frontload mechanism, or fully eject the ticket so that it falls into a tray. You can also select that a ticket should be redirected to a wastebasket as described above.

¹ Encoding in ISO standard format, or in hexadecimal format (bit-by-bit), is software selectable.

2**INSTALLATION**

The TTPM3 comes as desktop printer, or as an OEM printer mechanism for kiosk applications.

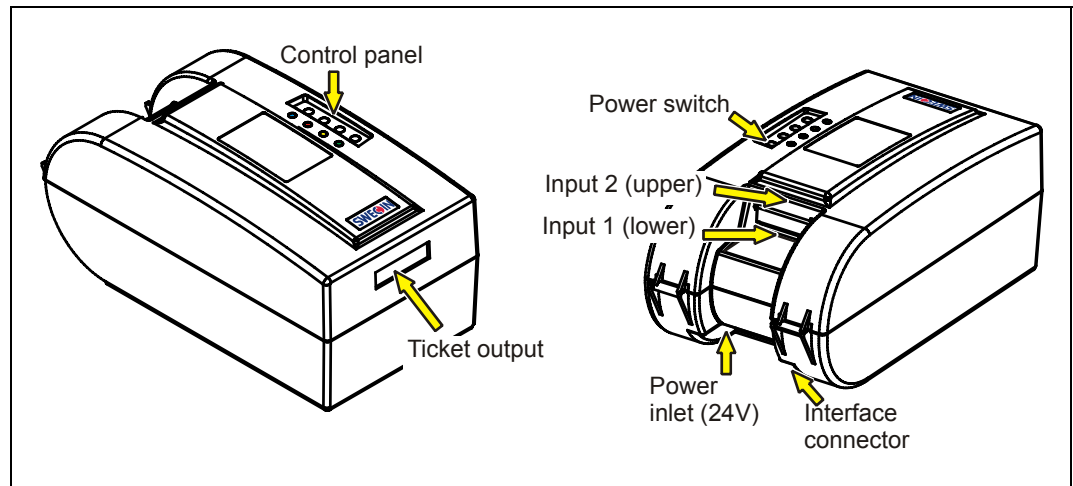


Figure 1. Desktop printer

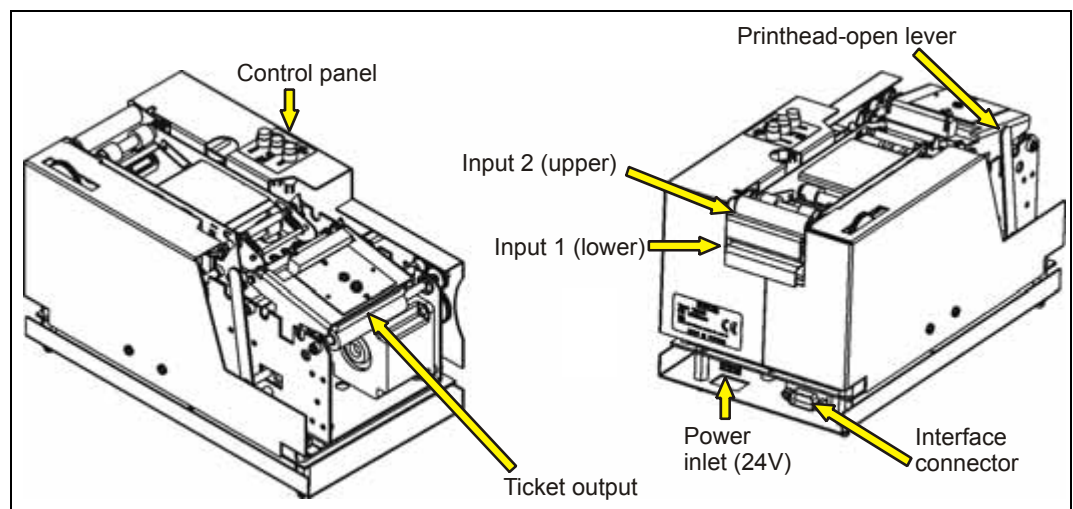


Figure 2. OEM printer mechanism

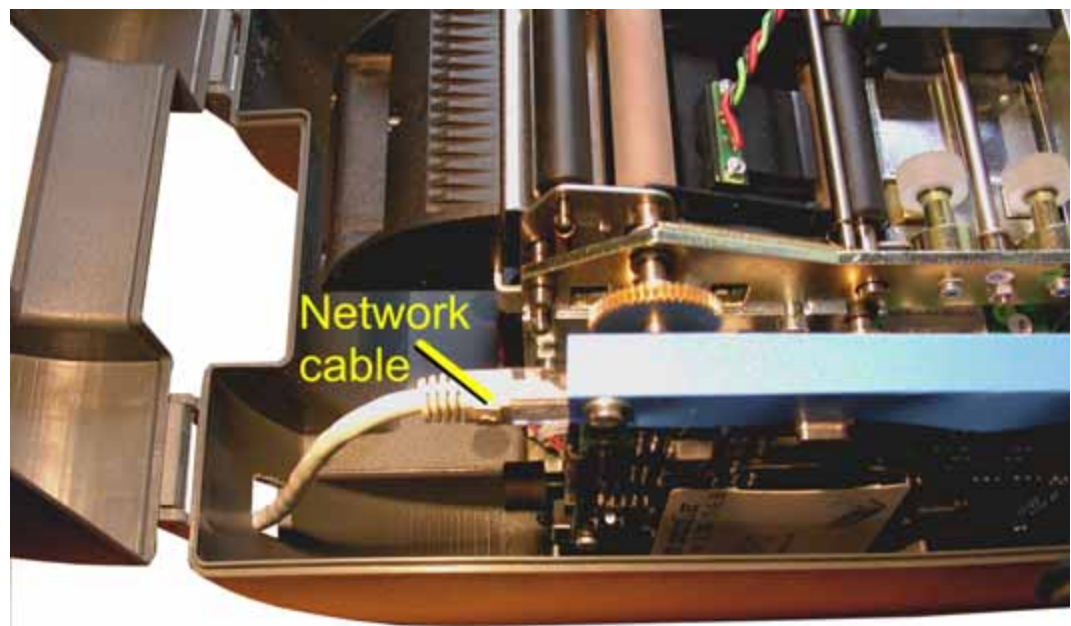
2.1 Installing a desktop printer

1. Connect the cable from the power supply to the connector at the back of the printer.
2. Connect the power supply to a line outlet with safety ground. The ground potential should be the same as for the host computer. If ground potentials differ, use a short distance modem between the computer and the printer.
3. Connect a serial cable between the COM port of the host computer and the serial input of the TTPM3 printer. For pin assignment, see page 70.
4. Turn on the printer. The blue and green indicators should light up.
5. Press the front button. The green indicator starts flashing and the yellow indicator lights up, indicating "Out of Paper".
6. Turn the tickets so that the magnetic stripe is on the left side facing downwards, as seen from the front of the printer.
7. Insert tickets in the lower document entry. The printer feeds the tickets forward and cuts and ejects one ticket.

The printer is ready for use.

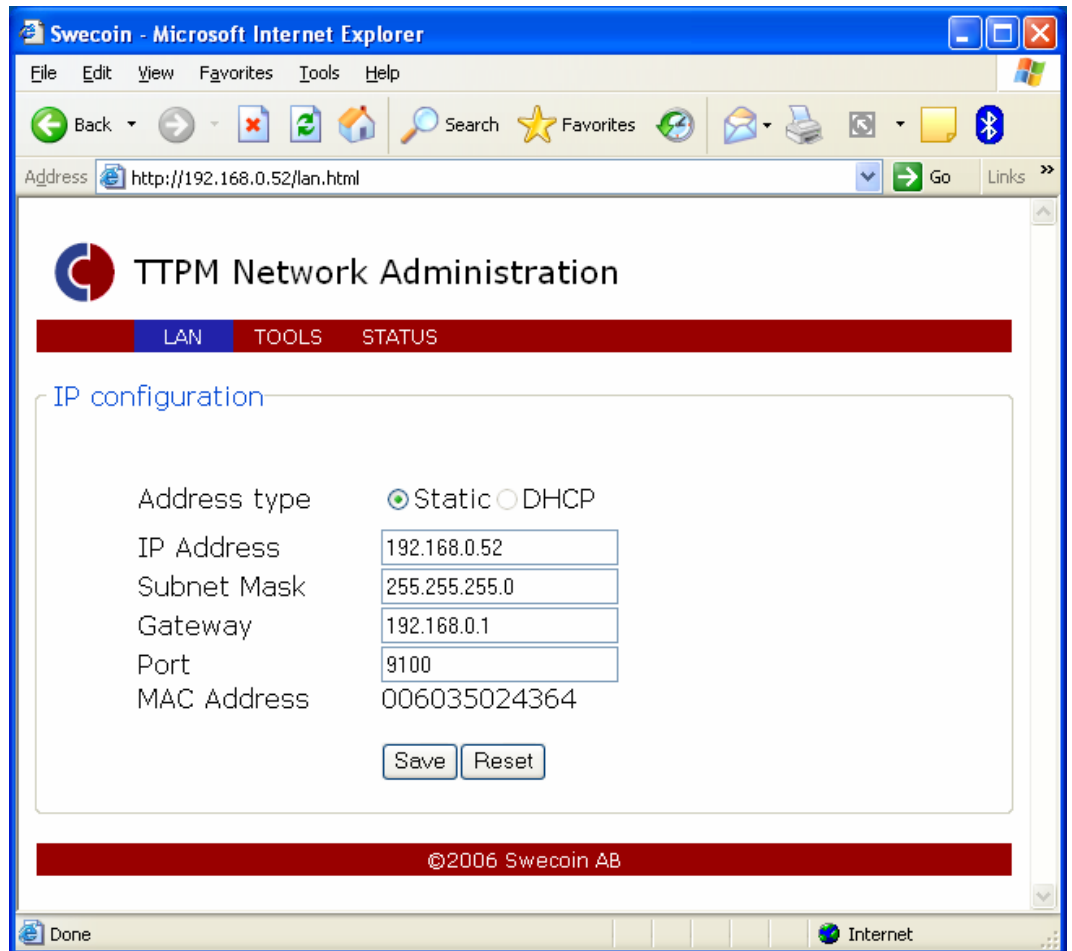
2.1.1 Network option

If the printer is equipped with a network card only network interface should be used.



1. Open the cover
2. Insert the network cable in the hole at the rear of the cover.
3. Connect the cable to the TCP/IP connector at the rear of the network card.
4. Take out the configuration ticket that sits in the holster on the side of the network card.
5. Start a web browser and enter the IP address printed on the configuration card, for example <http://192.168.0.52>

6. Now the server in the TTPM shows. Here you can set new address and print a new configuration card:



7. If you have problem finding the TTPM from your PC, please check that the PC uses the same third digit in the IP number as the printer does, for example: 192.168.0.52. If this digit differs, please temporarily change it to the same third digit as on the configuration card. Then connect to the printer and give the printer a new IP address that works in your network environment.

NOTE! – The serial connector on the back of the printer is used by the network card, so you cannot run both interfaces at once.

2.1.2 Testing

If you want to test the printer through the network you can use the SwcSockTerm.exe utility program that allows you to send command scripts and binary files to the printer.

2.1.3 Output tray or nozzle?

The output nozzle is used if the operator only prints one ticket at a time and should take the ticket from the printer.

The output tray collects the printed and coded tickets in a neat stack. Use the tray if you intend to print many tickets at a time.

1. If an output nozzle is fitted, press it out from behind and remove it
2. Loosen the two screws in the front a couple of turns
3. Hook the tray onto the screws and tighten them
4. Press tray downwards so it is securely fastened

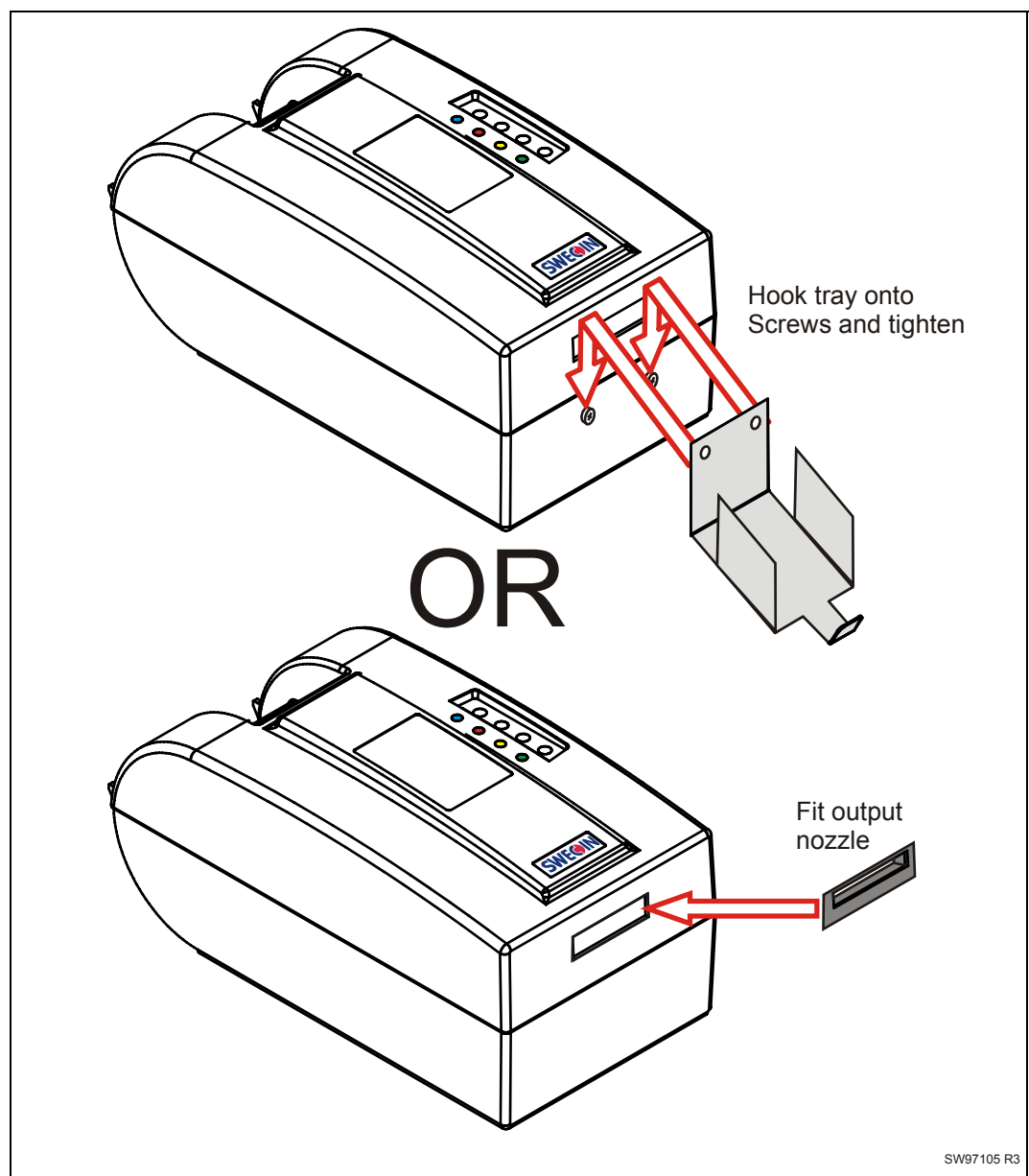


Figure 3. Installing an output tray or nozzle

2.2 Installing an OEM printer mechanism

The TTPM3 OEM printer mechanism should be installed in some kind of enclosure such as a self-service kiosk.

Preventing ESD and earth currents from affecting the printer operation requires proper connection of the printer chassis to protective earth through a mounting platform or through a separate earth conductor.

Trouble free printer operation also requires the printer's optical sensors to be shielded from ambient light.

Additional space is required for paper stock and handling. Consider mounting the printer on a movable platform so that the printer can be maintained outside the printer enclosure.

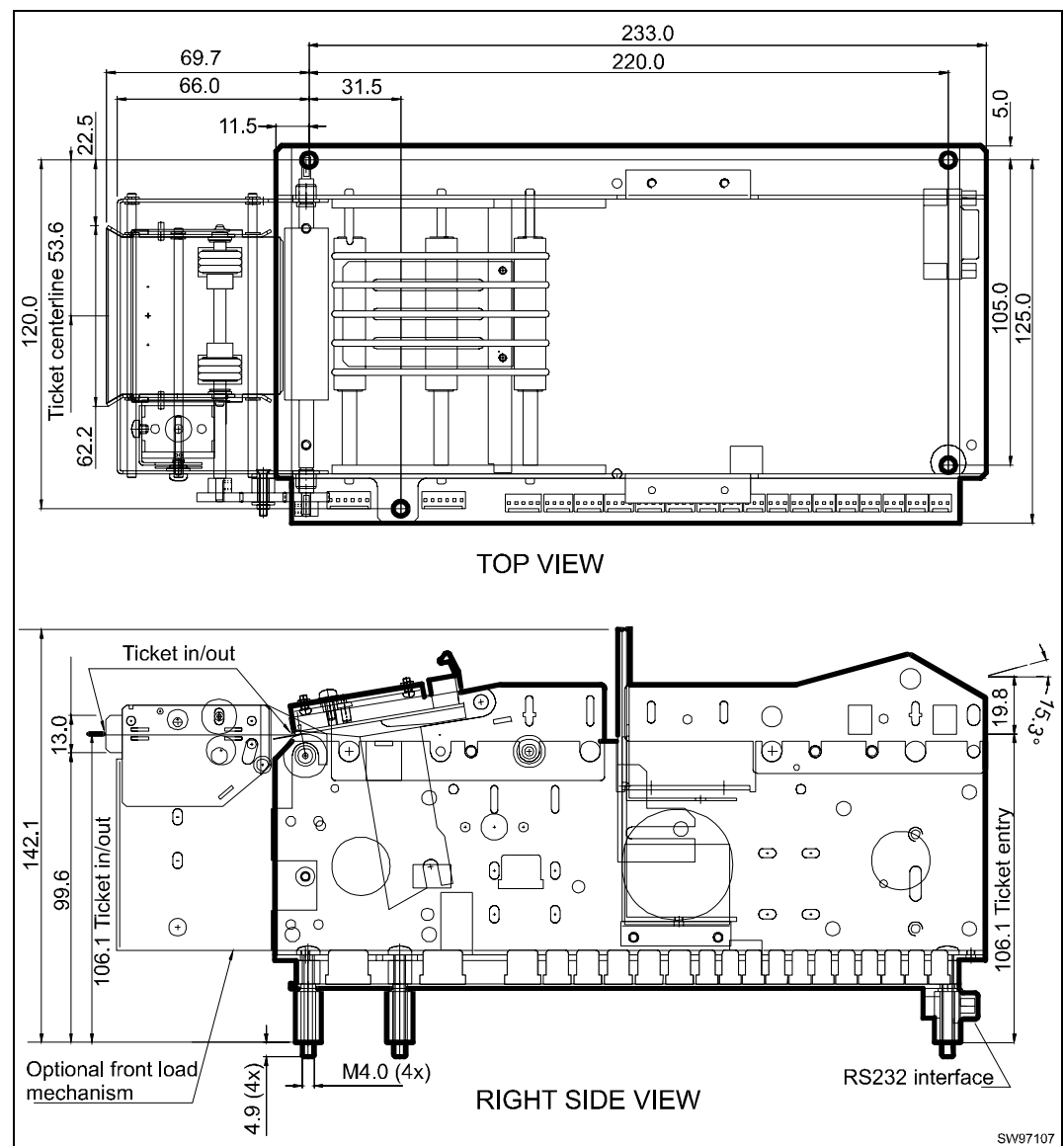


Figure 4. Dimension drawing for printer mechanism. All measurements are in mm

With Swecoin power supplies, just connect the cable from the power supply to J5.

If you use another type of power supply unit, 24 V cables are available from Swecoin AB, order No. 01370-000.

Should you make cables of your own, connect the voltages according to the following illustration. Note that protective ground and minus output should *not* be interconnected in the power supply. At the printer end of the cable, use an AMP Mate-N-Lok connector housing and two contact-sockets:

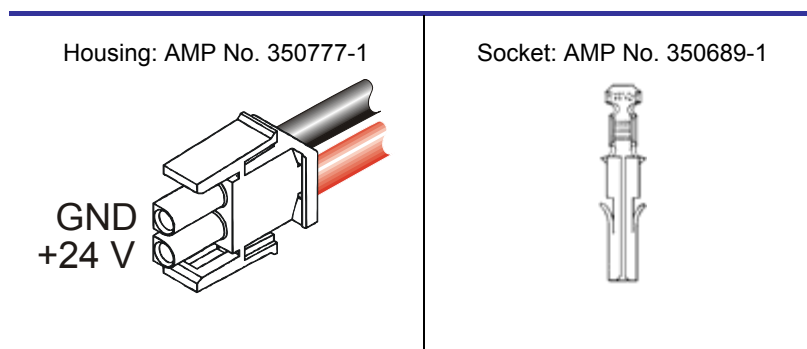


Figure 5. Power connection

Mode	
Idle	150 mA
Standard text printing	2 A average
Peak current	6 A

Table 1. Current consumption

NOTE! – The 24 V ground, as well as the chassis of the printer, must be connected to ground potential (safety ground).

After fastening the printer, proceed with the installation instructions for desktop printer on page 6.

3

OPERATION

3.1 Operator controls

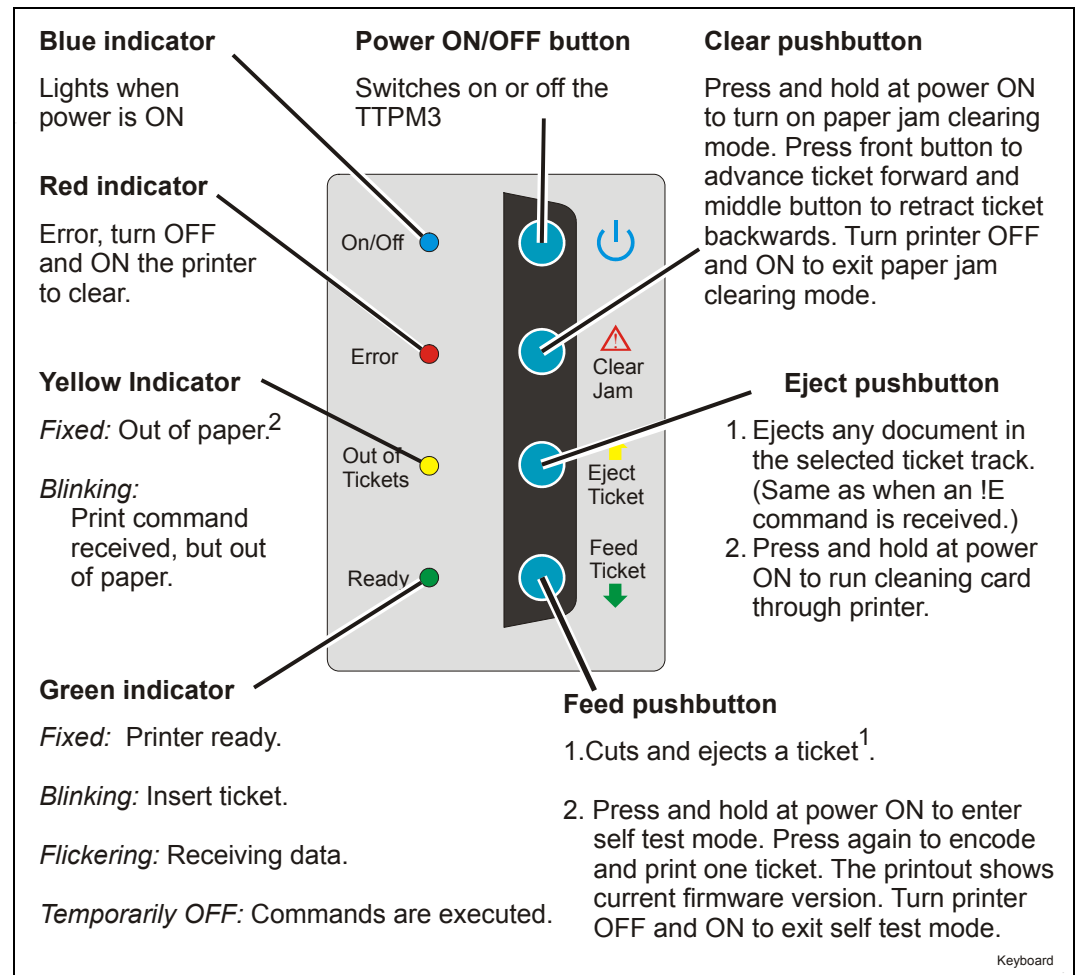


Figure 6. Indicators and pushbuttons

3.2 Paper loading

The yellow indicator indicates paper out.

Press the center button to eject remaining tickets if you want to replace paper stock before paper is out.

3.2.1 Loading through rear document entries

Insert the ticket stock into the desired document entry. When the ticket is detected by the input sensor it will be pulled into the active position. Consecutive ticket stock is usually loaded in the lower document entry, and single tickets in the upper document entry.

If the printer is configured for two consecutive entries, you may also use fanfold tickets in the upper document entry.

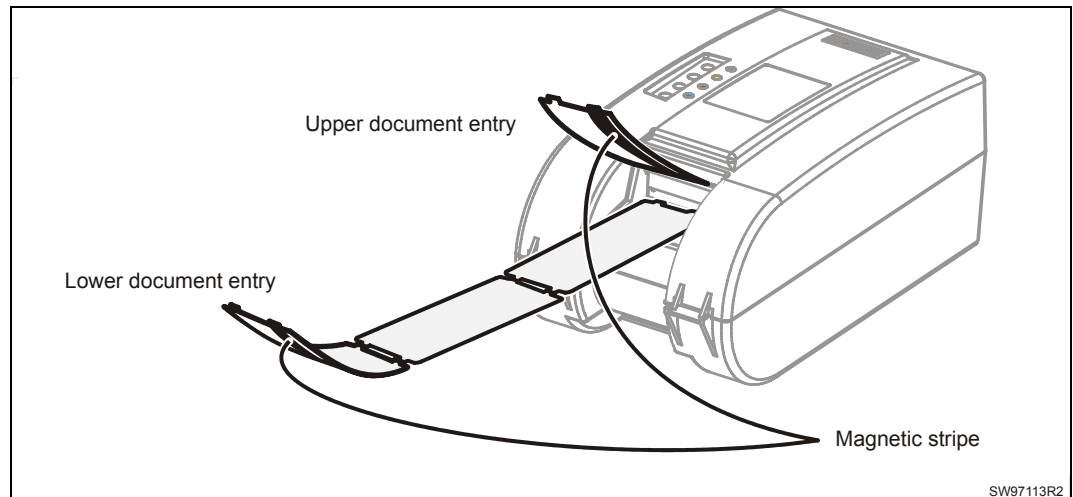


Figure 7. Position of the magnetic stripe when loading paper

3.2.2 Paper stock positioning

The ticket stock should be oriented with the magnetic stripe down to the left as seen from the front of the TTPM3. It is good practice to place the pile of fanfold tickets at a distance of at least one ticket length behind, and straight out from the printer.

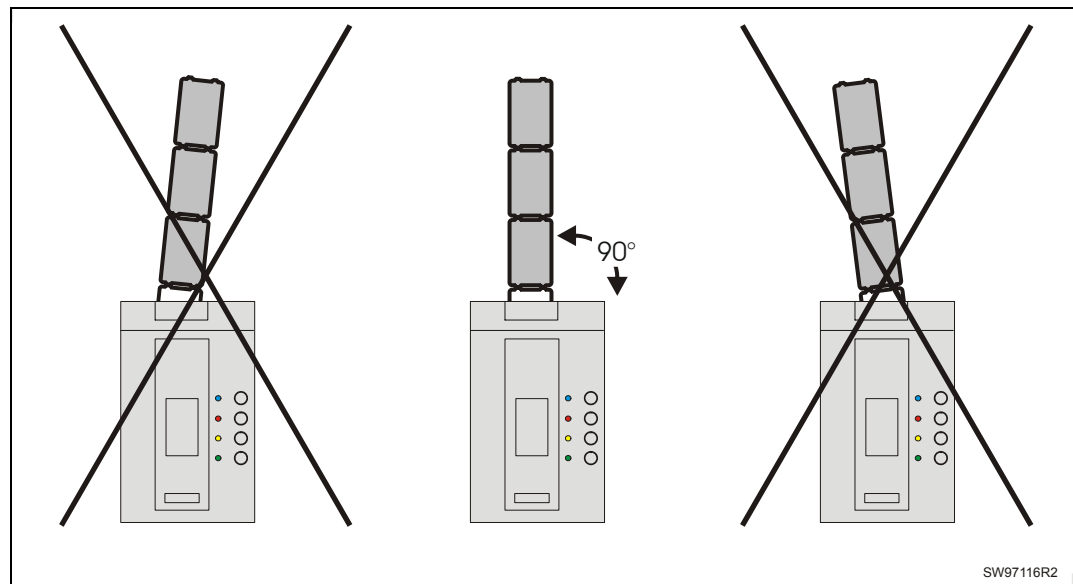


Figure 8. Positioning the ticket stock

3.2.3 Loading through front document entry (optional)

An **!L3** command must be sent to the printer to prepare it for front loading. When this command has been received and the input sensor detects a ticket being inserted into the document exit, it will be pulled into the active position of the upper rear document entry. For the magnetic stripe to be readable, the ticket must be inserted with the stripe facing down to the left, as seen from the front of the printer.

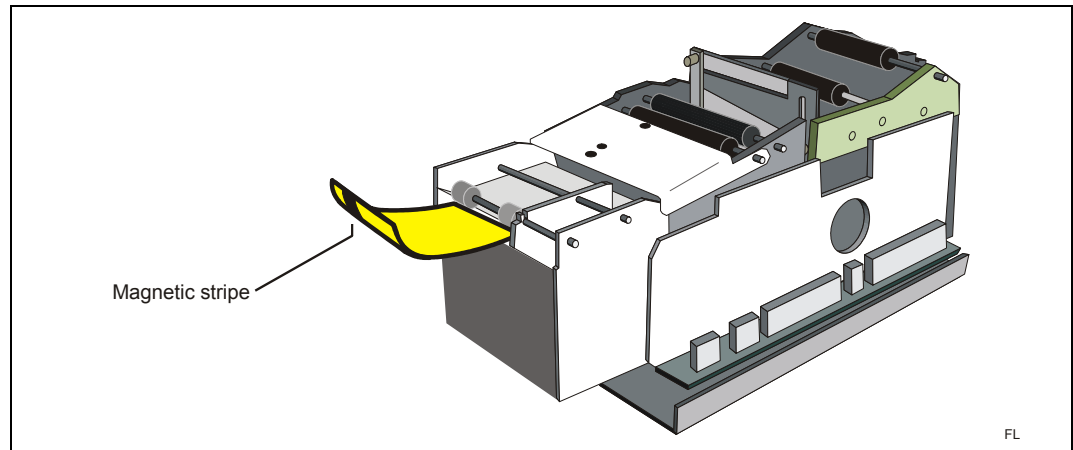


Figure 9. Position of the magnetic stripe at front load

3.3 Paper jam removal

Open the cover to locate and remove the ticket that is stuck in the mechanism. Use the following procedure:

3.3.1 Select paper jam clearing mode

1. Power OFF.
2. Push and hold the “Clear Jam” pushbutton while turning ON the power. The red indicator shows a steady light to indicate paper jam clearing mode.

3.3.2 Tickets stuck in input module

Press and hold the “Eject Ticket” push button to feed the ticket towards the rear of the unit.

3.3.3 Tickets stuck in output module

Press and hold the “Feed Ticket” push button to feed the ticket towards the front of the unit.

3.3.4 Exit paper jam clearing mode

Power OFF and back ON again, the TTPM2 is operational but any ticket information previously sent to the unit is lost.

You can also power OFF the printer and turn the feed rolls manually to remove the blocking ticket.

3.4 Self test mode/ticket repeat mode

3.4.1 Self test

1. Press and hold the front pushbutton at power ON to enter self-test mode.
2. Press again to encode and print one ticket. The printout shows current firmware version.
3. Turn printer OFF and ON to exit self-test mode.

3.4.2 Repeat fixed print

1. Start self-test mode as described above.
2. Download the ticket data to the printer, and print one ticket. The data must only contain fixed text, fixed encoding data, and graphics.
3. Press the front button once and an exact copy of the first ticket will be printed. This will be repeated each time that the front button is pressed.
4. Turn printer OFF and ON to return to normal operation.

NOTE! — *Do not hold the front button depressed!*
Doing so will result in erroneously cut tickets often resulting in paper jam.

NOTE! — *Repeating fixed print only works on printers where the auto clear function is OFF. Auto clear is enabled / disabled with a parameter setting.*

3.5 Error handling

The blue and green indicators lights up at power ON. If they fail to light up, switch the TTPM3 OFF and ON again. If the indicators are still OFF, check your power connection both in the TTPM3 and in the wall outlet. Also check your main power supply fuse.

3.5.1 TTPM3 start-up

The TTPM3 has Flash memory where the firmware and parameter settings are stored. All print field definitions are stored in RAM and disappears when the printer power is switched OFF.

POWER FAILURE CLEANUP

If “Clear ticket path at startup” is enabled (parameter 8), TTPM3 tries to find out if a ticket is in the ticket path at any other location than at the top of form position at power ON. If it finds a ticket, it destroys the magnetic encoding, prints VOID on it and outputs the ticket. If the printer is equipped with a front load 3 unit, the ticket is redirected to the waste bin.

START-UP SYNCHRONIZATION

To enable the TTPM3 to synchronize itself to the incoming data after power up, either after a usual power ON, or after a power failure, the printer has to receive either a !C command that it will execute, or a !P command that it will ignore.

Using the !C command to initiate the TTPM3 clears all data that has previously been stored. To avoid having data cleared, the !P command can be used, for example, to retain document data stored in the TTPM3 prior to a power failure or power OFF.

NOTE! – Please remember that the TTPM3 has to receive either the !C or !P command, after power up. All other commands and data will be ignored until !C or !P has been received.

3.5.2 Normal operation

Different error types can show up during processing. The most common is that the TTPM3 is out of paper. All errors encountered by the printer, and requiring operator assistance, are indicated with a signal from an indicator on top of the printer. The operator then has to follow a specific procedure depending on the type of error that caused the stop. The procedures are as follows:

- **Yellow indicator lights up**
Indicates “No paper” in the selected paper entry. Insert new paper supply or new - single ticket. The document will be automatically loaded to active position.
- **Yellow indicator ON and green indicator ON or flashing.**
No paper in the selected paper entry. Data string and print command have been received. Insert paper into the selected paper entry.
- **Red indicator lights up**
Indicates unsuccessful read-after-write. The TTPM3 makes a second attempt to encode and read the ticket. During that attempt the red indicator will go out. For each unsuccessful attempt, the red indicator lights up again. If a single-ticket operation is in progress, the red indicator stays ON until a new ticket is inserted and successfully processed. Also refer to the previously described procedures regarding the yellow and green indicators.
- **Red indicator is ON**
If the Red indicator stays ON, even though ticket stock is present in the selected entry station, this indicates that the paper path in the TTPM3 has been blocked. Follow the description on the next page to remove blockage.

NOTE! – No data is lost in the process of detecting and acting on errors as long as the printer is not switched OFF.

3.6 Single-ticket handling

3.6.1 Overview

The TTPM3 comes with one of two different single-ticket handling systems: upper rear entry load (standard), and front load (optional). In both cases, the upper document entry of the printer is used for the single-tickets.

This means that single-ticket processing restricts the use of fanfold ticket stock to the lower entry.

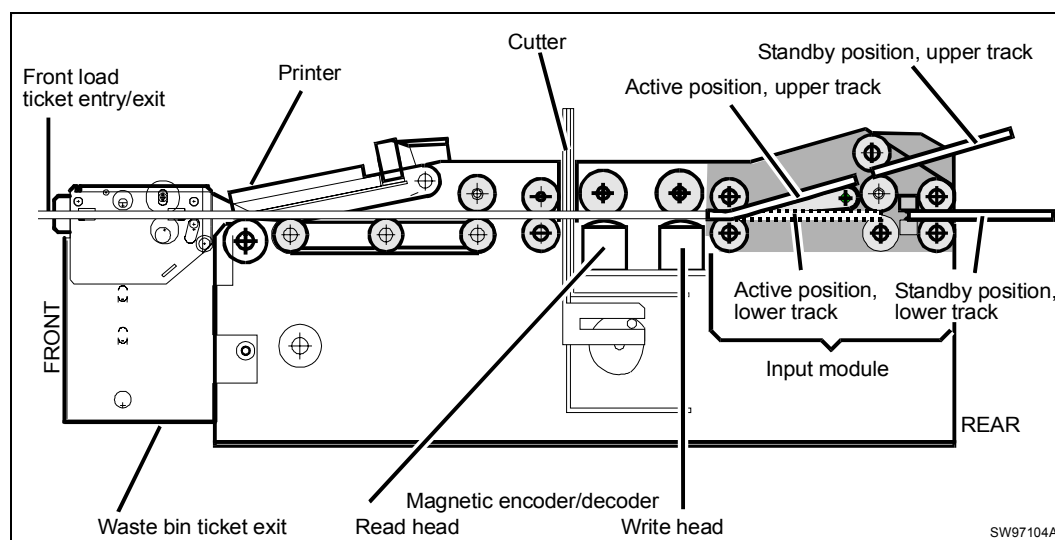


Figure 10. Active and standby ticket position

PREVIOUSLY ENCODED TICKETS

One use of the single ticket handling is to process a ticket several times. For example, if you issue a return train ticket (Stockholm to Oslo and back to Stockholm) you can add print, and re-encode the magnetic stripe when the first part of the journey is made.

1. Use the applicable decode-command to read the previously encoded ticket information.
2. The data is transmitted to the host computer, and the ticket is positioned in the active position of the upper entry, ready for a new encoding and printing.
3. Printing and encoding is affected using the same commands as for processing a ticket from a fan-fold ticket stock, and the ticket is ejected to the customer.

TIP!

To avoid printing on top of the existing print of a previously used ticket:

- Include information in the magnetically encoded string, about which area of the ticket has already been used for printing
- Read the magnetic stripe and let the host computer position new text on free spaces of the ticket.
- Update the magnetic stripe with correct information about used areas if the ticket should be used further.

3.6.2 Inserting a single ticket

In the standard TTPM3, inserting a single-ticket into the upper rear document entry, will trigger the single ticket loading process.

In front load printers, the application program must issue the command !L3 to trigger the single ticket loading. The yellow indicator on the printer will blink to indicate that the application program wants the operator to insert a single ticket. When a ticket is inserted, the loading process starts. To speed up ticket handling, the magnetic code of track two is

read and placed in memory when loading the ticket from the front load option. !D will read track two data from memory without having to move the ticket.

The single ticket loading process will retract the fanfold ticket stock in the lower document entry to a standby position, and position the single ticket in the active position of the upper entry.

The subsequent command string automatically processes the operation on the single-ticket form.

3.6.3 Read and decode

The following read (and decode) commands apply for the single ticket in active position:

!DA	Reads and decodes all three tracks and sends the data separated by CR LF.
!D1 !D2 !D3	Read and decode the track indicated by the digit. With front load option, track 2 (or center track) is read and the data stored in memory when the ticket is entered through the front entry. !D2 only reads the data from memory without moving the ticket. The read string is decoded and scanned for an end character (?). If found, the string is sent to the host computer in ASCII format. The start character is not included, but the stop character (?) and the checksum are transmitted. If no number is found, or if it does not comply with the ISO standard, a NAK+A is transmitted.
!O1 !O2 !O3	Read data from track 2 (or center track) and transmit data to host. No decoding takes place in the TTPM3. A one is transmitted as ASCII 1, and a zero as ASCII 0.

After reading the stripe, the ticket is automatically returned to active position waiting for either an eject-command for a command sequence for printing or encoding (or both) followed by !P for processing of that command string.

3.6.4 Encode and print

1. Encode a new or modified string on the magnetic stripe. Use any of the magnetic encoding commands !I, !J, !M, or !K #, !N, !K depending on what tracks are available in your printer, and what encoding you want. See page 42.
2. Format the new print using the !F command described on page 35.
3. Encode and print the ticket with the !P command.

The ticket will be ejected to the operator when correctly encoded and printed. In case of unsuccessful encoding, the single ticket is cancelled¹ and a new single-ticket form has to be inserted into the applicable document entry. A blinking yellow indicator prompts this.

¹ The number of encoding retries, as well as the text to be printed on cancelled tickets, can be set with the !F M command. See page 40. Cancelled tickets can be redirected to the optional front load waste bin by inserting an } or @ character in the string to be encoded on the stripe, see page 44.

3.6.5 Ejecting the ticket

If you want to eject the ticket without modifying the encoding or adding new print after reading the magnetic stripe, use an applicable eject command:

- !E Ejects the ticket through the upper rear document entry.
- !L4 Ejects the ticket through the front entry.
- !L5 Ejects the ticket to the waste bin of the TTPM3 Front Load 3.

4 PROGRAMMING

4.1 Syntax

- A command string always starts with an exclamation mark (ASCII 33 or HEX 21) serving as command identifier. The exclamation mark must be at the first position of the line, that is, directly after a CR LF. Otherwise it will not be recognized as command identifier.
- The characters immediately following the “!” (21H) form the actual command to the printer. The command consists of 1–3 characters and is followed, when applicable, by a sub command, formatting commands, and data separated by space characters as shown in Figure 11.
- Carriage Return and Line Feed end each command.

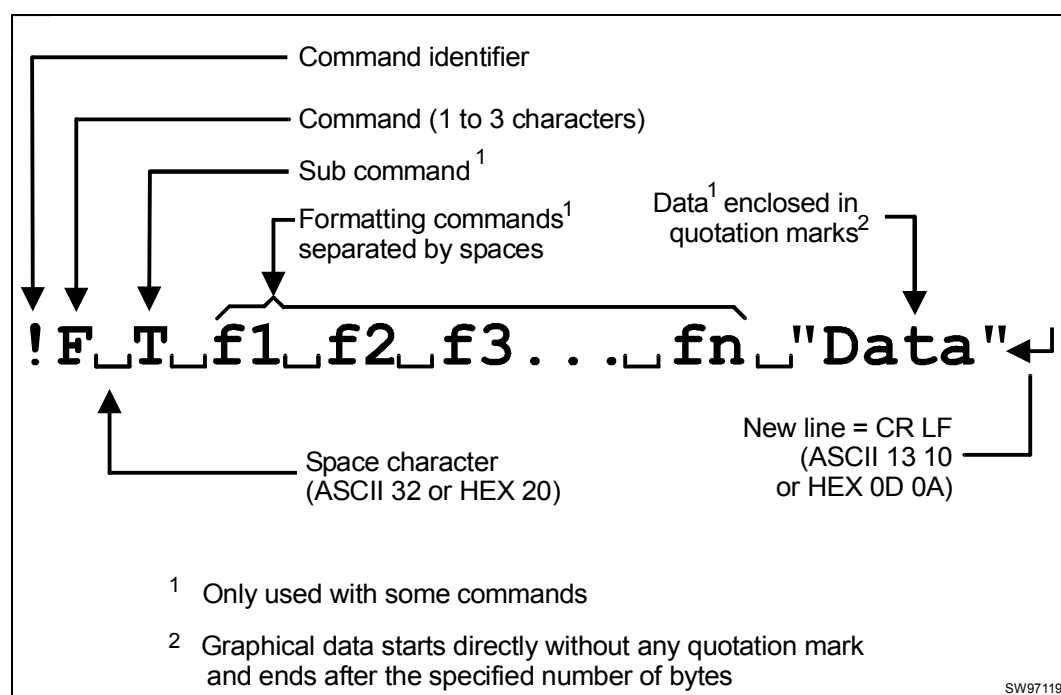


Figure 11. Command syntax

4.2 Initialization after power OFF

To initialize the printer after power ON you just send a clear command (!C) and the printer is ready for use.

NOTE! – If no clear command has been received, the first !P after power ON initializes the printer. No ticket is produced from the data sent before this !P.

4.3 Printing and encoding capability overview

4.3.1 Text

It is possible to print text in four fonts, in four orientations, and in 16 different sizes.

4.3.2 Graphics

Bitmap graphics, such as logotypes, prints in the size and orientation in which they were downloaded. Graphics print on all following tickets until a "Clear all" command is received, so you only have to download graphics once.

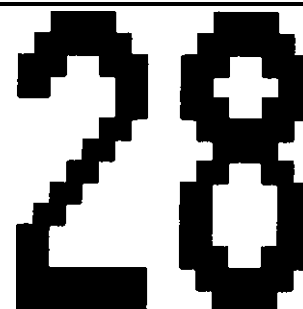
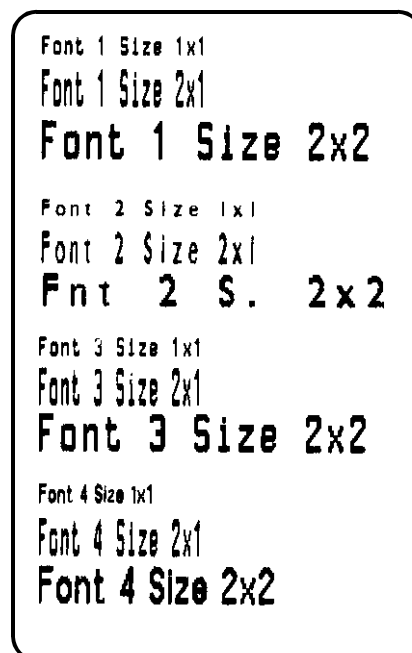
Remember, when creating graphics for the TTPM3 printer, that the pixels are not square, but has a height/width ratio of 1.32:1 in normal mode and 0.88:1 in high resolution mode.

4.3.3 Bar codes

Bar code data fed to the printer are converted to an EAN13, EAN 128, Code39, Code 128, and code 2-of-5 interleaved bar code. The bar code prints on all subsequent tickets until a "Clear all" command is received, or until new bar code data with the same coordinates and type is received.

4.3.4 Magnetic codes

Messages can be magnetically encoded on a stripe at the back of the ticket. The message can be between 37 and 107 characters long depending on the coding standard and density you select.



Font size 16x16

SW97120

Figure 12. Font examples

4.3.5 Positioning data on the ticket

Items to be printed are positioned by defining the X and Y coordinate of the upper left corner, and the orientation.

Print can overlap other print. You can for instance print text on top of graphics.

4.3.6 Triggering a printout

Putting text, graphics, bar and magnetic codes on the ticket as described above only builds an image of the ticket in the printer memory. To actually print something on a ticket, you must send a print command:

!PJ

Every received "IP CR LF" prints one ticket. (If the printer is configured for dual consecutive entries, you must also send a select document entry command, see page 32.)

4.3.7 Command acknowledgment

Ticket issuing is automatically acknowledged by the TTPM3 by sending an ACK (06h) to the host computer after a successful read-after-write of the encoded magnetic information.

If no encoding command and data are sent to the TTPM3, the ACK is still sent (read-after-write verifies that no data is encoded).

Some other commands are also acknowledged; see "Error Codes and Status reporting" on page 65.

NOTE! – ACK/NAK must be enabled through parameter n5, see page 60.

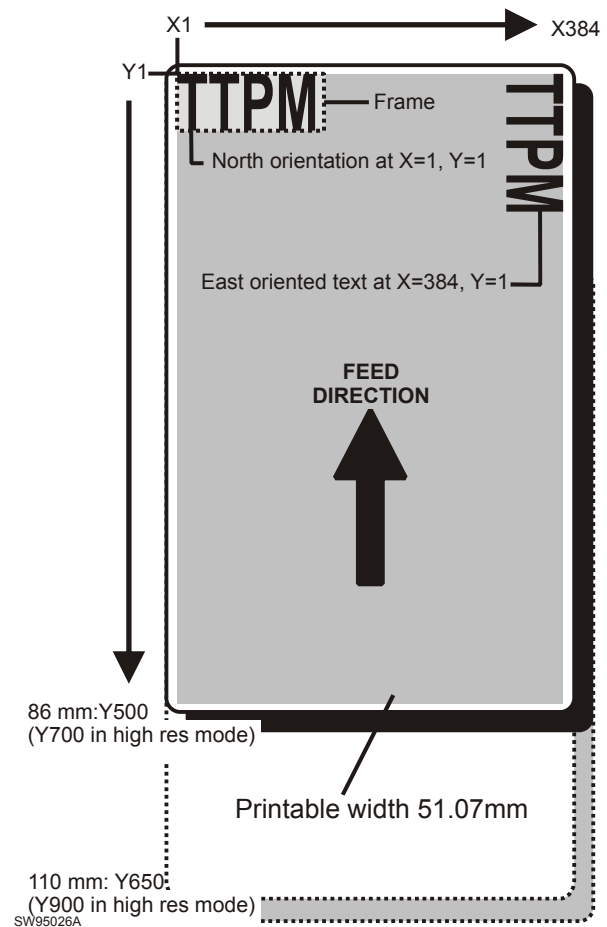


Figure 13. Coordinates on the ticket

4.3.8 Additional commands

In addition to the command that specifies the print, there are a number of other commands used for functions such as:

- Clearing of the TTPM3 buffer
- Selection of document entry
- Decoding of documents
- Generation of status requests

All applicable commands are listed in the following pages. Detailed descriptions of the software commands are given with syntax explanations as well as commented examples.

4.3.9 Ticket memory

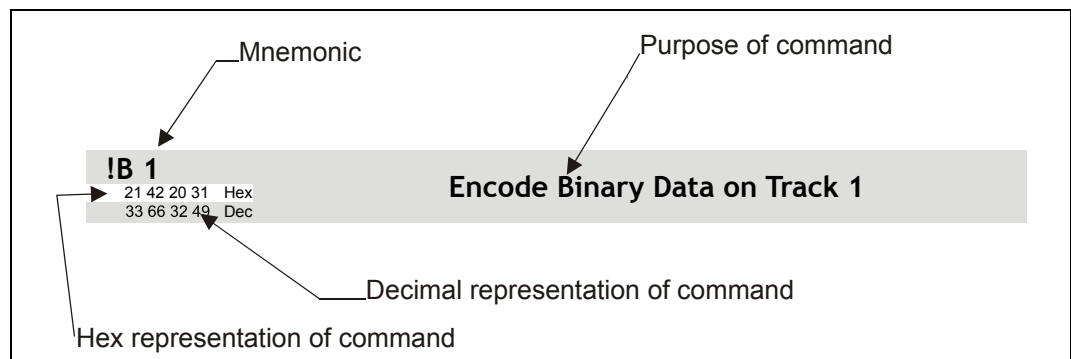
The TTPM3 printer has 128k of RAM. This memory is used as input buffer and storage for the ticket image before being printed out. The memory is cleared at power off.

In normal resolution mode, the ticket image is 384x512 pixels for an 86 mm ticket, and 384x656 pixels for a 110mm ticket.

In high resolution mode, the ticket image is 384x727 pixels for an 86 mm ticket, and 384x935 pixels for a 110mm ticket.

NOTE! – *Make sure not to print data outside this area when you use the !F command. If you do, you write in parts of the memory that are used for other functions in the printer, and the result is totally unpredictable.*

4.4 How the commands are described



4.4.1 Mnemonic

Mnemonic is the popular command name that should be easy to remember.

4.4.2 Hex

Give the command in hex representation

4.4.3 Decimal

Give the command in decimal representation

4.4.4 Values

n1, n2, etc. represents values that you set with the commands. What you should enter here depends on what you want the command to do.

4.4.5 Examples

Command examples are formatted in **Courier** and typed in the same way as used in the Swecoin TTP editor:

```
!P<CR><LF>
```

Where **<CR>** means the carriage return character 13 decimal (hex D). Numbers between less-than and greater-than characters, for example **<001><019>**, means 1 and 19 decimal. When the numbers indicate a hex value, h is appended to the number (**<01h><13h>**).

EXAMPLE:

<065>, **<65d>**, **<41h>** and **A** are four different ways of expressing the character A.

4.5 Summary of commands

4.5.1 System commands

!C	Clear all	27
!C 1	Clear retract counter	30
!C A	Clear all and enable extended acknowledgement	22
!F A	Feed- acceleration and speed	31
!P	Encode and print document	27
!P @	Encode and print document, and eject it in wastebasket (FL3 printers)	27
!P E	Encode and print document, and eject it to tray (for FL3 printers)	27
!U	Firmware version query	29
!S	Status request	28
!S L	Status request, paper low	
!S R	Power has been off?	29
ENQ	Status request immediate	30
CAN	General reset, equivalent to power OFF/ON (takes 20 s to execute)	
!Q	Writes a transaction string to non-volatile memory	28
!V	Reads the transaction string written by !Q	29
!W	Reads thermal print progress indicator	29
!X	Set resolution	29
!Y	Read ticket counter	30
!Y 1	Read retract counter	30
!Z	Burn time	30

4.5.2 Document entry commands

!A	Sets ticket length for roll ticket without black marks or gaps	32
!E	Ejects document through the upper rear document entry (for example after decoding)	32
!L 1	Selects lower rear document entry, and waits if paper is out (for units with dual consecutive entries ¹)	32
!L 2	Selects upper rear document entry, and waits if paper is out (for units with dual consecutive entries ¹)	32
!L 3	Loads document through front entry	32
!L 4	Ejects document through front entry	33
!L 5	Transports document to waste bin (only for printers with front load 2 and 3)	33
!L 6	Reads a ticket from frontload and immediately ejects ticket	
!L 17	Selects lower rear document entry and signals if paper is out	34
!L 18	Selects upper rear document entry and signals if paper is out	34
!T	Sets timeout for retract function	34

¹ !L1, !L2, !L17 or !L18 **must** be selected when configured for dual document entries

4.5.3 Print-data commands¹

!F T	Print text	35
!F G	Print graphics	36
!F C	Print bar code	38
!F M	Specifies No. of retries + cancellation text to be printed if encoding fails	40
!F L	Print logotype	?

4.5.4 Magnetic encoding/decoding commands

!B 1	Encode data in Hex format on track 1	42
!B 2	Encode data in Hex format on track 2 (or center track)	42
!B 3	Encode data in Hex format on track 3	42
!N	Same as !B 2, for compatibility with TTPM2 ²	
!N+	Same as !N but reverses the bit order	
!K	Same as !B 3, for compatibility with TTPM2	
!K+	Same as !K but reverses the bit order	
!O 1	Reads data in Hex format from track 1 (or center track)	43
!O 2	Reads data in Hex format from track 2 (or center track)	43
!O 3	Reads data in Hex format from track 3 (or center track)	43
!J	Encode data in ISO format on track 1	43
!M	Encode data in ISO format on track 2 (or center track)	43
!I	Encode data in ISO format on track 3	43
!D A	Reads and decodes data in ISO format from track 1, 2, and 3	43
!D 1	Reads and decodes data in ISO format from track 1	43
!D 2	Reads and decodes data in ISO format from track 2 (or center track)	43
!D 3	Reads and decodes data in ISO format from track 3	43
!D	Same as !D 2, for compatibility with TTPM2	

4.5.5 Storage commands

!H P n1 n2	Set parameter value	48
!H S	Store current parameter values	48
!S P n1	Parameter value enquiry	49
!H F	Load Firmware	49
!H C	Load Font	50
!H C E	Erase all Fonts	50
!H L	Load Logotype	?
!H L E	Erase all Logotypes	?

¹ See note about Ticket memory on page 23.

² Grayed commands are obsolete, or not yet implemented (firmware version 5.12)

4.6 Command Reference

The commands in this section are grouped after what they do, and these groups are sorted in a theoretical usage sequence. It starts with commands for setting up the printer — through document entry commands — text-and-graphics commands — encoding / reading commands. Then we end with storage commands that handle the flash memory of the printer.

4.6.1 System commands

!C		Clear all	
21 43 n1	Hex		
33 67 n1	decimal		

This command takes no parameter. All definitions are cleared. Stored layout is erased. Subsequent !C's are ignored.

The !C command is also used to initialize TTPM3 after a power ON.

Auto-clear can be used to clear the memory between tickets instead of using !C. Auto-clear executes faster than !C. When auto-clear is enabled any !C commands in the received data will be ignored, apart from when initiating the printer. Use parameter 57 to enable/disable auto-clear.

!CA, adding an A to the !C command enables extended acknowledgement.

!C1, adding the digit 1 to the !C command clears the wastebasket counter. See !Y1.

!P		Print	
21 50	Hex		
33 80	Decimal		

This command triggers both the encoding, printing, cutting and ejecting of a ticket.

Printing follows a successful encoding. The magnetic code and print information, as well as cut and eject behavior, must first be defined using the applicable commands.

If !P is received before a clear all command after power ON, the !P will initiate the printer without printing a ticket. This means that all data received prior to the !P will be discarded.

If !P is received and the printer is out of paper, it will give error code NAK P and discard the received data.

EJECT TO WASTE BASKET

Adding an @ character (!P@) makes the printer eject the completed ticket into wastebasket (FL3 printers). One use for this can be to make status printouts that are not intended for the customer.

ENCODING RETRIES

Adding a single digit after the !P makes it possible to set the maximum number of encoding retries for one ticket. The number given is the number of additional tries i.e.

!P 1 means one normal attempt plus one retry. Default is 1, which is the value used if no digit is present.

EJECT FULLY

Adding an E (**!PE**) makes the printer eject the ticket fully so that it can fall down into a tray (for FL3 printers)

Digits and @, or digits and E can be mixed on the same line, for example **!P5@** makes five encoding retries, and ejects the ticket into the wastebasket.

!Q		Write transaction string	
21 51 n1...n15	Hex		
33 81 n1...n15	Decimal		

!Q writes a string with up to 15 ASCII characters to a non-volatile buffer memory in the printer.

Example: **!Q asdfgh <CR><LF>**

After the ticket has been correctly encoded / printed, the string is copied to a non-volatile buffer. This buffer can be read by the **!V**-command.

The transaction string is committed at the precise point where a useable ticket has been produced. The only way to reset a transaction string is to successfully print another useable ticket that was initiated with **!Q**.

!S		Status request	
21 53	Hex		
33 83	Decimal		

The TTPM3 responds by sending two bytes to the host computer. Byte 1 indicates the status of the various TTPM3 sensors according to the following table. Byte 2 reports the temperature of the thermal print head and is only used internally in the TTPM3.

Bit	Function	Sensor	Value "1"	Value "0"
0	Lower rear document entry	J6	Paper present	No paper
1	Upper rear document entry	J7	Paper present	No paper
2	Top-of-form	J8	Paper present	No paper
3	Cutter position	J9	Paper present	No paper
4	After cutter position	J10	Paper present	No paper
5	Cutter	J21	Cutter home	Cutter not home ¹
6	Print head	—	OK	Error
7	Front Load Sensor	J11	Paper present	No paper

See also: ENQ

¹ On CD200 versions with "card level low" sensor, this bit indicates low card level. (printer version 02441-002, 5600-A0015)

!S D

21 53 20 44	Hex
33 83 32 68	Decimal

Status request, DIP-switch settings ¹

The TTPM3 responds with one byte containing 1 bit for each switch. 1 = on, 0 = off.

Bit	7	6	5	4	3	2	1	0
Dip switch No:	8	7	6	5	4	3	2	1

!S R

21 53 20 52	Hex
33 83 32 82	Decimal

Power has been off?

!S R answers with one byte a 1 (31h) if the power has been off since the last time you asked or a 0 (30h) if the power has been on since the last check.

A hardware reset does not activate the bit. It requires a genuine power off to be set to 1.

!U

21 55	Hex
33 85	Decimal

Firmware version query

The TTPM3 responds by sending the following string:

30906_480 TTPM3 Ticket Printer/Encoder

Where 30906 is the firmware number for a standard TTPM3, and 480 is the firmware revision, in this case 4.80.

!V

21 56	Hex
33 86	Decimal

Read transaction string

Reads the string stored by !Q from the memory in the printer.

!W

21 57	Hex
33 87	Decimal

Read thermal print progress indicator

Reads a value indicating the number of bytes actually printed on the ticket (both blank and non blank). The number consists of 4 hexadecimal digits and should normally be equal to 5BE0. A lower number together with the absence of the 03H indicates that the last ticket was not fully printed and a decision may be taken whether the system should reissue the ticket or alert the supervisor.

This is a safety feature to minimize the risk of valid tickets being duplicated without attention from the system, by turning off the power at a certain point.

!X

21 58	Hex
33 88	Decimal

Set resolution

This command sets the resolution of the print. This only affects the resolution in the transport direction of the ticket.

0=normal resolution, (5.7dots/mm).

1=high resolution (8.5 dots/mm).

¹ This is for compatibility with older TTPM's. They had a DIP-switch on the control board instead of a parameter memory.

!Y

21 59	Hex
33 89	Decimal

Read ticket counter

This command reads out the value of the internal ticket counter from the control board. This counter starts from 0 when the printer is new and is incremented by one for each completed !P sequence.

The result is sent as 12 decimal digits + CR + LF

!Y 1

21 59 31	Hex
33 89 49	Decimal

Read retract counter

Reads out the internal retract counter. This counter is incremented by one for each ticket that is retracted and thrown in the wastebasket.

To reset the counter to zero, send the command !c1

The result is sent as 12 decimal digits + CR + LF

NOTE! – *Retract function is only available on printers with waste bin option (part of front load FL3 and FL4).*

!Z

21 5A	Hex
33 90	Decimal

Set burn time

The burn time controls the print density. It is used to set the heating so that it is adequate for the thermal paper used as ticket material. Set it to the lowest burn time that gives acceptable print quality.

Example: !Z 20 <CR><LF>
sets burn time 640 μ s

The burn time setting is stored in the non-volatile memory.

Power off/on reset returns the setting to default value.

Setting	Burn time	Print density	
16	512 μ s	Test	Lightest print
17	544 μ s	Test	
18	576 μ s	Test	
19	608 μ s	Test	
20	640 μ s	Test	Default
21	672 μ s	Test	
22	704 μ s	Test	
23	736 μ s	Test	
24	768 μ s	Test	
25	800 μ s	Test	
26	832 μ s	Test	
27	864 μ s	Test	
28	896 μ s	Test	
29	928 μ s	Test	
30	960 μ s	Test	
31	992 μ s	Test	Darkest print

CAUTION! – *A longer burn time put more load on the printhead, so do not use a longer burn time than required for a clearly legible print. Settings over 27 are not recommended.*

ENQ

05	Hex
05	Decimal

Status request, immediate

The TTPM3 responds by sending the same 1 byte response to the host computer as is sent as byte 1 in response to the !S command. The ENQ command is effected immediately after receipt, whereas the !S command is effected in sequence when received.

!F A N				Feed- acceleration and speed	
21 46 20 41				Hex	
33 70 32 65				Decimal	

TTPM3 has two feed motors, one for encoding and one for printing. This command sets the start-frequency and the top speed of each motor.

NOTE1! – This command should not be used! Suitable speed is selected by Swecoin and set as default parameters in the firmware. The speed setting has to reflect the motors fitted in the printer and the mechanical buildup of the printer. A single unit may be tunable to a higher speed but it is not certain that the settings work on the next printer.

NOTE2! – Power off/on will set the values to factory default.

Syntax for defining and downloading graphics data is as follows:

!F A N <start freq> <top speed> <motor> 1 1 1_ "remark"

!F	Command to load print-parameter information.
A	Indicates acceleration and speed mode.
N	Print orientation. This is ignored in acceleration and speed mode. Orientation is always North (N). The printer requires the N to be inserted.
<start freq>	Start frequency. Set the base frequency from where the acceleration starts. A value of 30 indicates a start frequency of 300 Hz.
Top speed	Top speed is the frequency at which the acceleration stops. A value of 450 sets top speed to 4500 Hz.
motor	"1" selects encoding motor, while "2" selects print motor
1	Not used. Must be set to 1.
1	Not used. Must be set to 1.
1	Not used for graphics printing. Must be set to 1.
space	One space has to follow the "1" before the graphics data.
Remark	Here you can enter a remark describing the setting you just did. It will not be printed.

Example:

```
!C<CR><LF>
!F A N 30 250 1 1 1 1 "Encode speed (full-step)"<CR><LF>
!F A N 30 190 2 1 1 1 "Print speed (half-step)"<CR><LF>
!P<CR><LF>
```

4.6.2 Document-entry related commands

!A

21 41	Hex
33 65	Decimal

Set ticket length for roll paper

This command sets the ticket length if paper without gaps or black marks is used. One step is 0.67mm.

!A 127 sets up a credit car sized ticket length.

!A 0 turns off the function and reverts to gapped ticket stock. This is the default setting.

The mechanics of TTPM3 works with ticket lengths between 54 and 120 mm.

!E

21 45	Hex
33 69	Decimal

Eject through rear document entry

This command ejects, through the rear document entry, any document positioned in the active position for encoding (or after decoding). See page 16 for definition of active/standby ticket position.

!L 1

21 4C 31	Hex
33 76 49	Decimal

Select lower rear document entry

Selects lower rear document-entry and feed the leading document, in the consecutive supply entry, to active position. If, in the preceding operation, the upper rear document entry has been engaged, the document in that entry is retracted from the active position.

NOTE! — *When set up as a dual document entry printer, a “select rear entry” command (!L1, !L2, !L17 or !L18) must precede the print command (!P). An ACK character is returned if the command was successful.*

If no paper is present, the yellow indicator lights up and the printer waits until the operator insert new paper stock.

Note that ACK/NAK signaling must be enabled (DIP switch no. 6)

See alternative command !L17.

!L 2

21 4C 32	Hex
33 76 50	Decimal

Select upper rear document entry

Same function as !L1, but selects upper rear document entry.

See alternative command !L18.

!L 3

21 4C 33	Hex
33 76 51	Decimal

Load document from front entry (front load printers only)

This command lifts the print head for a specified time, to permit document insertion through the TTPM3 front document entry/exit. At the same time, any document in active position is retracted. The document inserted in the front document input/exit is loaded into the printer and placed in active position in the upper entry, see page 16 for entry definition.

To speed up ticket handling, the magnetic code is read and placed in memory when loading the ticket. !D1, !D2, and !D3 will read data from memory without having to move

the ticket. Issuing a second read command will move the tickets over the read head and back to make a new read from the ticket.

On error, the TTPM3 sends the following error codes to the host computer:

Error code	Error
NAK+B	No document is inserted within 60 seconds. Command !L3 is abandoned.
NAK+C	A document is inserted and immediately retracted.
NAK+D	A document is inserted, but the TTPM3 is blocked (paper jam)
NAK+E	Paper jam in the input feeder during an !L3 command.

A front loaded document resting in active position can be processed using one of the following alternatives:

- Using the appropriate decode command !D1, !D2, !D3 or !O1, !O2, !O3.
- Using print parameter format command !F and applicable encoding command !I, !J, !K, !M or !N, followed by print command !P.
- Document related commands !E, !L4 and !L5.

!L 4

21 4C 34	Hex
33 76 52	Decimal

Eject document through front document entry (only already cut ticket)

A document positioned in the active position is ejected through the front document entry, without encoding or printing.

Compare with the !E command that ejects the document through the upper rear document entry.

!L 5

21 4C 35	Hex
33 76 53	Decimal

Eject document into waste bin (only printers w. waste bin)

Only for printers with front load 3 (with waste bin): This command transports the ticket from active position to the waste bin. The same function can be obtained for cancelled tickets if character "@" or a "}" is inserted into the string of data to be encoded.

!L 6

21 4C 36	Hex
33 76 54	Decimal

Read ticket from front load

Only for printers with front load: Reads the ticket from the front load and immediately ejects it back out without transporting the ticket to the active position. This command can be used to read tickets in a printer that is configured for two consecutive tracks (where the normal !L3 command would push out the ticket from the upper entry to make place for the ticket from the frontload).

!L 17**Select lower rear document entry and signal if paper is out
(only dual entry printers)**

21 4C 31 37	Hex
33 76 49 55	Decimal

Same function as !L1, but when ticket loading fails the printer sends an error code (NAK + '1') instead of waiting for paper to be loaded. It is then up to the system to determine if paper should be loaded from the upper document entry instead.

!L 18**Select upper rear document entry and signal if paper is out
(only dual entry printers)**

21 4C 31 38	Hex
33 76 49 56	Decimal

Same function as !L2, but when ticket loading fails the printer sends an error code (NAK + '1'). It is then up to the system to determine if paper should be loaded from the lower document entry instead.

!T**Sets timeout for retract function (only printers w. waste bin)**

21 54 n1...n2	Hex
33 84 n1...n2	Decimal

!T@nn

nn is the delay in seconds

When a ticket is left in the output of the front load after the timeout nn has expired, NAK F is sent to the host controller to indicate that the ticket hasn't been picked up.

If the customer takes the ticket before the timeout elapses, the printer sends a Bel (07H) character.

@ Expands the signaling: If you have a Front load with waste basket function, the printer retracts the uncollected ticket and ejects it into the wastebasket exit.

NOTE1! – The !T command should be sent after the !P (print) command

NOTE2! – DIP-switch 6 must be ON for status replies to be sent.

EXAMPLE:

```
!P
!T @20
```

Retracts the ticket and sends NAK F if it has not been taken within 20 seconds

4.6.3 Print related commands**INTRODUCTION**

!F is the general command for formatting the ticket print.

!F<type> <data>

The parameters are used as follows:

!F Indicates that this is the start of a print field definition

<type>	Specifies the type of the field T = Text G = Graphics M = Magnetic encoding failure, ticket cancellation (See page 40) C = Bar Code
<data>	Depends on the type of field specified. See the following pages.

4.6.4 Text printing

!F T		Format text for printing	
21 46 20 54 20 n1...n8	Hex		
33 70 32 84 32 n1...n8	Decimal		
!F T <orientation> <xpos> <ypos> 1 <height> <width> <"text">			
The parameters are used as follows:			
!F	Indicates that this is the start of a print field definition		
T	Indicates text mode		
<orientation>	Specifies the way in which the text is to be oriented. This can be either N(orth), E(ast), S(outh) or W(est). This terminology is described in detail in the examples given in this document. Specific fonts may be limited to one orientation only, see below.		
<xpos> <ypos>	Specifies starting position for the text on the ticket. That is, the distance in pixels from the upper left corner of the printable area to the upper left-hand pixel of the bounding box of the first character to be printed. Note that the resolution is 7.52 pixels/mm on the X-axis and 5.7 pixels/mm on the Y-axis.		
<fixed pitch>	No. of pixels from the start of one character to the start of the next. Range 6 to 16. A value below 6 sets the default pitch.		
<hr/> NOTE! – Only used for font 1. Must be set to 1 for all other fonts. <hr/>			
<height> <width>	Specifies the height and width expansion of characters to be printed. The height range is 1–16 times the default value. The width range is 1–16 for fonts 1 and 4, and 1–3 for fonts 2 and 3. See font samples on page 21.		
	Selects the font (text appearance). Fonts 1, 2, 3, and 4 apply. Font 2 and 3 can only be North oriented. Fonts 1 and 4 can be set to any orientation. Font 4 is a proportional character font. See font samples on page 21. Font appearance may differ from the font samples if you have custom firmware in your printer.		
<hr/> NOTE! – The space to the following character is included in the matrix of the character, and that the pixels are not square at normal resolution. <hr/>			
<"text">	Text to be printed enclosed in quotes (" ").		
Example of a command for text: !F T N 150 150 1 1 1 1 "Text"␣			

4.6.5 Graphics printing

!F G										Format graphics for printing									
21	46	20	47	20	n1...	n8			Hex										
33	70	32	71	32	n1...	n8			Decimal										

TTPM3 can print bit map graphics. Graphic images are stored in the fixed memory area and will therefore be repeated on every ticket until the next !C command is received.

Remember, when creating graphics for the TTPM3 printer, that the pixels are not square but have a height/width ratio of 1.32:1 or 0.88:1 depending on resolution setting.

Syntax for defining and downloading graphics data is as follows:

!F G <orientation> <xpos> <ypos> 1 <height> <width> 1_<Graphic_data>

!F	Command to load print-parameter information.
G	Indicates graphics mode.
<orientation>	Print orientation. This is ignored in graphics mode. Orientation is always North (N). The printer requires the N to be inserted.
xpos	Horizontal starting position in pixels for the upper left-hand corner of the graphics block. Position will automatically be rounded off to be divisible by 8 as a graphic block has to start at the first bit in a byte.
ypos	Vertical starting position in pixels for the upper left corner of the graphics block.
1	Not used for graphics printing. Must be set to 1.
height	Height in pixel lines of the graphic block. The length of the ticket determines maximum height. For an 86 mm ticket the maximum height is approximately 500 pixel-lines.
width	Width in bytes of the graphic block. Maximum width is 48 bytes .
1	Not used for graphics printing. Must be set to 1.
space	One space has to follow the "1" before the graphics data.
Graphic_data	This is a block of bit mapped graphics data. The block is stored in the printer starting at <xpos>, <ypos>. The numbers of bytes specified by <width> are stored in one pixel line. The <ypos> is then incremented and the next line is stored. This is repeated <height> number of times. It is up to the user to send the correct number of bytes to the printer, that is, <height> × <width>, as the printer will scan the input character stream for the correct number of bytes.

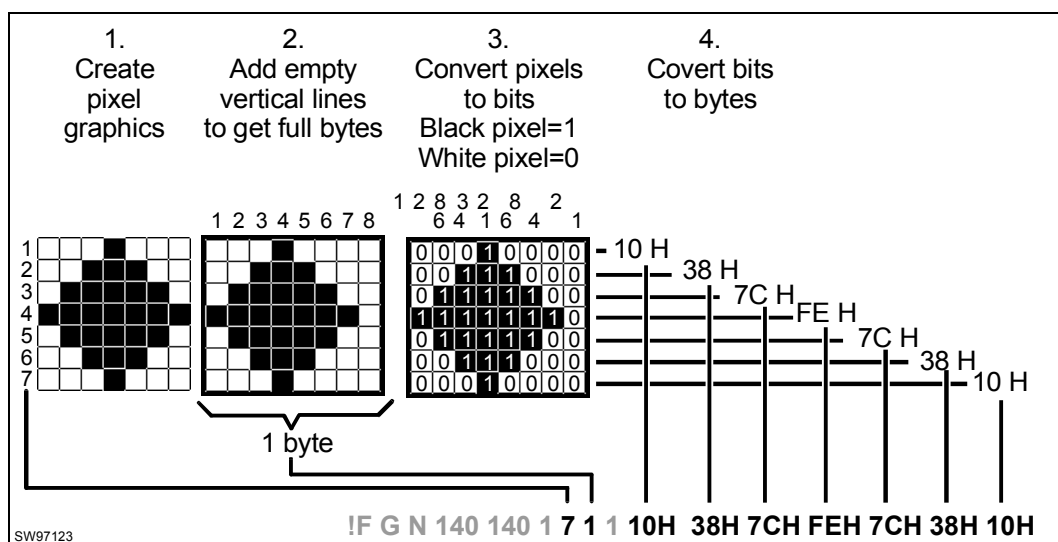


Figure 14. Converting graphics to TTPM3 format. Note that the appearance on your screen depends on the editor you use to write your program.

A file for downloading and printing the above graphics will look like this, in Windows Notepad:

```
!C
!C
!F G N 140 140 1 7 1 1 •8|p|8• !C
!C
!L1
!P
```

A utility program called Swecoin TTPM editor can help you convert Windows bitmap images (BMP-files) to TTPM graphics format. You can download the TTPM editor free of charge from the Swecoin Internet web site at <http://www.swecoin.se>.

4.6.6 Printing bar codes

!F C		
21 46 20 43 20 n1...n8	Hex	
33 70 32 67 32 n1...n8	Decimal	

Format bar code for printing

Bar code printing can be used as ticket data carrier instead of, or in addition to, magnetic encoding.

NOTE! – *To produce sharp code bars, the TTPM3 printer automatically reduces the print speed by approx. 50% when printing tickets with east and west oriented bar codes. This speed reduction is only valid for bar widths 1 and 2. Wider bar codes are printed at full speed.*

Bar code data is treated as fixed data. You can however replace a bar code by overlaying the previous data with new bar code data on the same X- and Y-coordinates. This way you avoid deleting the complete ticket with a reset (!C) when you want to update the bar code.

The syntax for defining and downloading of bar code data is as follows:

!F C <orientation> <xpos> <ypos> <bar 1> <height> <bar 2> <type> _ <"bar code data">

!F Command to load print parameter information

C Indicates bar code mode

<orientation> Indicates print orientation. Can be north (N), east (E), south (S), or west (W).

xpos Starting position (pixel) for the upper, left-hand corner of the first code bar in the string. Automatically rounded off to be divisible by 8, (first bit in a byte).

ypos Starting position (pixel) for the upper, left-hand corner of the first code bar

Bar 1 Width in pixels of both black and white bars, range 1–16.
For EAN13 and EAN/Code 128 the value must be set to 1.
For Code 39 and Code 2-of-5 this sets the **wide bars**.

height Code bar height in pixels

Value	1 =	16 pixels =	2.7 mm
	2 =	32 pixels =	5.3 mm
	3 =	48 pixels =	etc.
	4 =	64 pixels =	
	5 =	80 pixels =	
	...		
	16 =	256 pixels =	42.7 mm

Bar 2 Width in pixels of both black and white bars, range 1–16.
For EAN13 and EAN/Code 128 the wide/narrow ration is fixed and this sets the width of the entire code.
For Code 39 and Code 2-of-5 this sets the **narrow bars**.

type Selects type of bar code. The following types are available:

Value 1 = EAN13 (partly implemented, no check sum)

Value 2 = Code 2-of-5 interleaved

Value 8 = EAN 128

Value 9 = Code 128

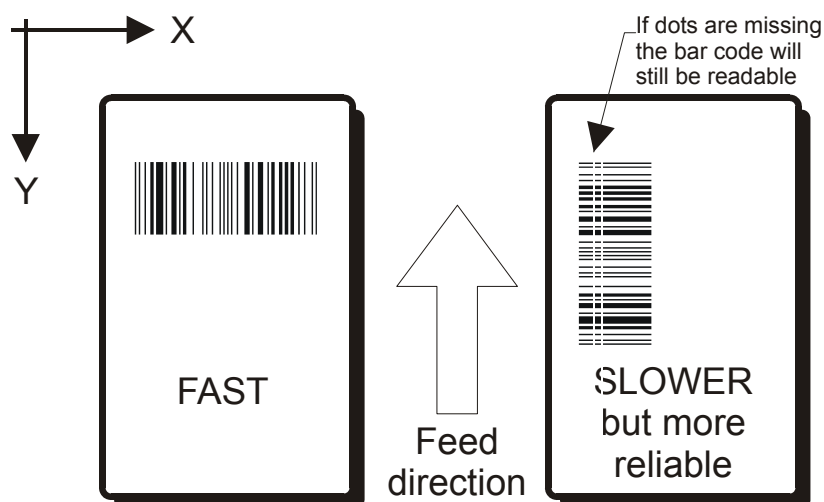
Value 11 = Code 39

space A space (blank) has to be inserted between the type parameter and the data string.

bar code data This is a block of data to be converted by the TTPM3 and printed in bar code form in accordance with the parameters identified. For available characters and data string formats, please refer to the specific type of bar code.

The following command string produces the ticket illustrated to the left below:

```
!C
!L1
!F C N 12 102 1 4 3 1 "1234567890128"
!P
```



SW97103A

Figure 15. EAN13 bar code. Use east or west oriented bar codes wherever possible, to guarantee readability.

Code 39 example

```
!F C N 100 230 6 2 2 11 "12345"
```

Code 128 example

```
!F C N 100 320 1 5 2 9 "abc123"
```

Code 2-of-5 example

```
!F C N 100 410 5 2 2 2 "123456"
```

NOTE! – Code 2-of-5 must have an even number of digits.

4.6.7 Canceling a ticket

!F M		Format print on cancelled ticket	
21 46 20 4D 20 n1...n8	Hex		
33 70 32 77 32 n1...n8	Decimal		

The TTPM3 can cancel a ticket after an unsuccessful magnetic encoding. The feature relates to the read-after-write function¹. When the <message> has been encoded, the TTPM3 reads and compares the magnetically encoded message with the original <message> string. If the comparison is negative, a second attempt to encode/read the same ticket is done. If also this attempt is negative, the ticket is cancelled. The magnetic stripe is erased and stripes are printed across the ticket (see figure below).

By default the TTPM3 attempts to encode three tickets. The desired number of attempts, as well as the text used to indicate the cancellation, is programmable through a subcommand to the !F command as follows:

!F M <orientation> <xpos> <ypos> <attempts> <height> <width> <"text">

All parameters must be specified.

The syntax is identical to !F T with the exception of the parameters <"text"> and <attempts>.

Text must be a text string.

Attempts are the number of tickets the TTPM3 should attempt to encode. If <attempts> is set to 1, the TTPM3 will make only one attempt (plus the automatic second attempt on the same ticket) to encode the ticket. If this fails, <text> will be superimposed on the ticket that is now being printed.

Setting <attempts> = 2 results in one striped ticket (first unsuccessful attempt) and the superimposed text for the second unsuccessfully attempted ticket and so on.

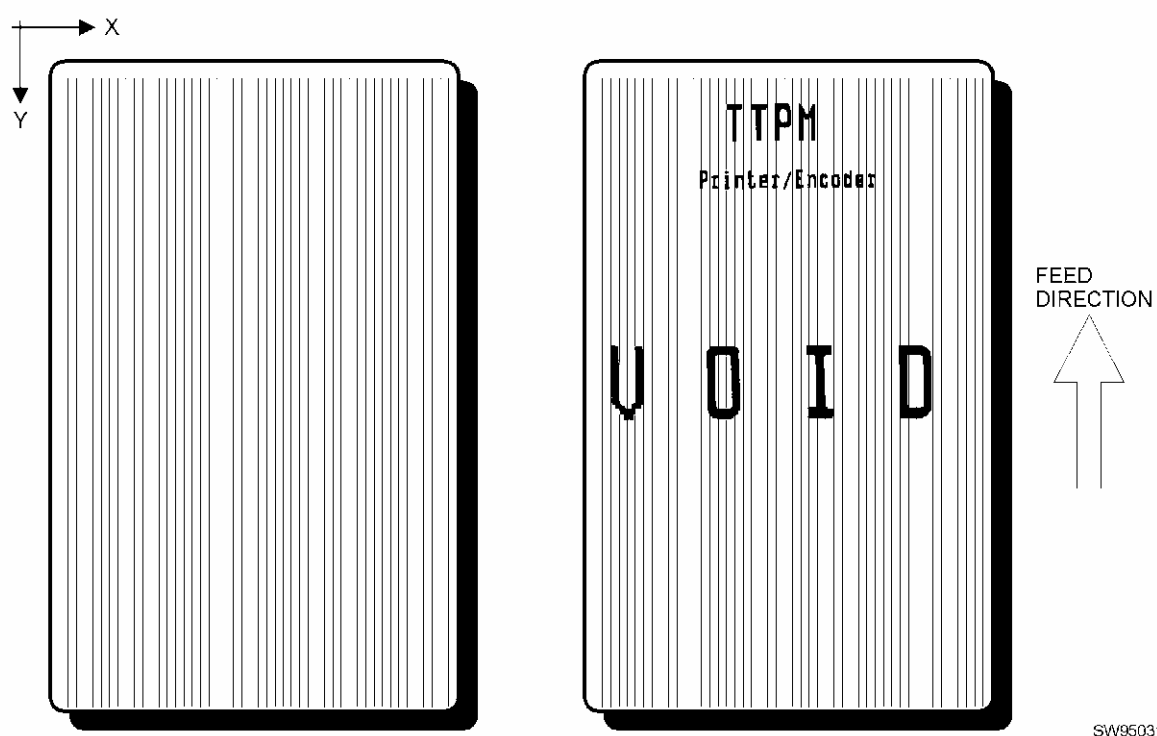
It is also possible to set how many times the printer should try to verify each ticket by adding a single digit after the !P command. This is described in the !P command description.

All parameters in this command are stored in memory and remain in effect until overwritten or the power is interrupted.

The following command string produces the tickets illustrated below at 2 unsuccessful encoding attempts:

```
!F M N 20 200 2 8 8 1 "VOID"
```

¹ Inserting an asterisk (*) in the data string to be encoded disables the read after write feature, see page 44.



SW95031

Figure 16. Indication of 1st and 2nd unsuccessful read-after-write

4.6.8 Magnetic encoding- and decoding-related commands

Track number and type of encoding (ISO standard or hexadecimal bit-by-bit) is determined by the encoding command used as specified below:

ENCODING

Syntax <command><message>␣

!M 12345␣ Encodes 12345 on track 2

Track	Encoding method	Commands Encoding	Reading	Characters
Track 1 210 bpi	ISO	!J	!D 1	79 ASCII alpha
	Binary	!B 1	!O 1	480 bits (120 hex)
Track 2 75 bpi	ISO	!M	!D 2	37 ASCII digits
	Binary	!B 2	!O 2	200 bits (50 hex)
Track 3 210 bpi	ISO	!I	!D 3	117 ASCII digits
	Binary	!B 3	!O 3	480 bits (120 hex)

NOTE! — With HiCo encoding, only one track at a time can be used for encoding or reading. In this case, code first track with | or \$ in the magnetic string to return the ticket to active position after coding, then reset the printer with !C, and code the other track and print the ticket.

!B

21 42	Hex
33 66	Decimal

Encode Binary data

Encodes binary data to the specified track

The bit order specified with parameters 19 to 21

When using binary data you are in total control over the encoded data. Data is sent to the printer as hex nibbles. You have to specify leading synchronization zeroes, start sentinel and stop sentinel yourself.

- Leading zeroes are used by the readers to determine swiping speed. The first 7 mm of the tickets should contain leading zeroes.
- The start sentinel identifies the beginning of data.
- The stop sentinel identifies the end of data.
- Trailing zeroes are used as leading zeroes if the ticket is swiped backwards. These are added automatically by the printer, so *do not* add those to the string.

Example:

```
!B 1 0000000000000000FF1234567890ABCDEF99<CR><LF>
```

In the above example we have 15 leading zeroes, FF as a start sentinel and 99 as stop sentinel.

15 leading zero nibbles give $15 \times 4 \text{ bits} = 60 \text{ bits}$ at $210 \text{ bits/inch} = 7.2 \text{ mm}$.

FF as start sentinel encode 11111111 which is easy to detect.

99 as stop sentinel encode 10011001, equally easy to detect.

!J

21 4A	Hex
33 74	Decimal

Encode ISO data, track 1

This command encodes upper case ASCII text and digits to track 1 of the ticket.

NOTE! – *The space character is a valid encode on track 1, so remember that if you insert a space character after !J, it will be encoded on the stripe.*

See page 46 for a list of the characters that can be encoded.

!M

21 4D	Hex
33 77	Decimal

Encode ISO data, track 2

This command encodes ASCII digits to track 2 of the ticket.

!I

21 49	Hex
33 73	Decimal

Encode ISO data, track 3

This command encodes ASCII digits to track 3 of the ticket.

!D

21 44	Hex
33 68	Decimal

Reads and decodes ISO data

- !D 1** Reads and decodes ISO track 1 and transmits the data to the host computer.
- !D 2** Same as !D1 but reads and decodes ISO track 2 (or center track)
- !D 3** Same as !D1 but reads and decodes ISO track 3
- !D A** Reads and decodes all three ISO tracks

The ticket is taken from active position, and after reading, the ticket returns to active position.

!O

21 4F	Hex
33 79	Decimal

Reads binary data

- !O 1** Reads and transmits bit-by-bit data, from ISO track position 1, to the host computer. No decoding takes place in the TTPM3. A one is transmitted as ASCII 1, and a zero as ASCII 0.
- !O 2** Same as !O1 but reads and decodes ISO track 2 (or center track)
- !O 3** Same as !O1 but reads and decodes ISO track 3 (or center track)

The ticket is taken from active position, and after reading, the ticket returns to active position.

4.6.9 Additional encoding information

CHECKSUM

To ensure correct reception of the message to be magnetically encoded, a checksum can be appended to the data by the host computer. This checksum will then be compared by the TTPM3 before encoding which guarantees that the magnetic code data is correctly received.

1. Calculate the checksum as the modulo 2 sum (consecutive XOR) of the ASCII data bytes sent in the !M command. The checksum must have bit 7 set to 1 to distinguish it from ordinary data.
2. Append the checksum at the end of the !M data string when encoding ISO data at track 2 (or center track).
3. When the message has been received, the TTPM3 calculates the checksum and compares it to the checksum appended to the message. If they are identical, an ACK is returned, otherwise a NAK followed by the checksum calculated by the TTPM3 will be returned.

The checksum is never encoded on the magnetic stripe; it is only intended to secure data transmission. The ISO format itself automatically adds a check digit to the magnetic code.

READING AND DECODING

MAGNETIC ENCODING ATTRIBUTES

The magnetic encoding data strings can be given attributes that govern versions of the standard encode/read-after-write routines and cancellation functions.

The following attributes, inserted anywhere in the applicable data strings, will cause the following functional deviations from default standards:

NOTE – *The attributes in parenthesis only work for the !M command*

- { (or *) Cancels the read-after-write function. The ticket is encoded and directly transported forwards for separation (if applicable) and subsequent printing according to the !F command data without prior read-after-write.
- | (or \$) Encodes the ticket, performs read-after-write, but does not transport the ticket for printing. Instead, the ticket is backed into the active position without being cut, waiting for the command to proceed, for instance, for a decode operation.
- } (or @) Expands the read-after-write operation. If this is successful, the ticket is processed in accordance with standard routines, that is, it is separated and printed. If the read-after-write operation is unsuccessful in the programmed number of attempts, the ticket is transported forwards, and the waste bin of the front load mechanism is activated (only printers with front load & waste bin option). The ticket is dropped into a waste bin.
-] (\$@) Combining the characters | and } results in normal behavior if the encoding was successful. If an error occurs then the ticket is transported back to the start position and NAK + 'E' is sent.

- ~ Encodes the ticket, performs read-after-write, and cuts the ticket. The ticket stops after the cutter (where the after cutter sensor still can see the ticket). Here it waits for print data and !P command before proceeding to be printed and ejected to the customer
 Apart from print data and !P, only the following commands are allowed. !L3, !L4, and !L5.
 !L5 "Eject document into waste bin" will throw away the ticket from the waiting position into the waste bin without erasing the data to avoid that the ticket material in the upper track is being pushed out.
- (minus sign) Disables encoding on magnetic retries. If magnetic retries occur it is almost certain that it is the read-after-write fails due to interference. If encoding is disabled on the retry, the interference level is drastically reduced and the possibility of a successful reading increases. This is especially useful for HiCo tickets.

MAGNETIC ENCODING RETRIES

See "Canceling a ticket" on page 40.

ENCODING TWO TRACKS ON A HICO TICKET:

```
!C␣
!M 1234567890123456789012345678901234567 |␣
!P␣
!C␣
!J ON TRACK 1 YOU CAN ENCODE UP TO 79 ASCII ALPHANUMERICAL
CHARACTERS AND DIGITS␣
F T N 50 140 1 1 1 3 "HiCo Test"␣
!P␣
```

The | character in the string makes the ticket return to active position after encoding this track

4.6.10 What can you encode?

TRACK 1 ISO ENCODING

ASCII	Character	Parity	Magcode	
32	Space	1	000000	
33	!	0	000001	Character not defined in Standards
34	"	0	000010	Character not defined in Standards
35	#	1	000011	
36	\$	0	000100	
37	%	1	000101	Start Character (Start Sentinel)
38	&	1	000110	Character not defined in Standards
39	'	0	000111	Character not defined in Standards
40	(	0	001000	
41	)	1	001001	
42	*	1	001010	Character not defined in Standards
43	+	0	001011	Character not defined in Standards
44	,	1	001100	Character not defined in Standards
45	-	0	001101	
46	.	0	001110	
47	/	1	001111	
48	0	0	010000	
49	1	1	010001	
50	2	1	010010	
51	3	0	010011	
52	4	1	010100	
53	5	0	010101	
54	6	0	010110	
55	7	1	010111	
56	8	1	011000	
57	9	0	011001	
58	:	0	011010	Character not defined in Standards
59	;	1	011011	Character not defined in Standards
60	<	0	011100	Character not defined in Standards
61	=	1	011101	
62	>	1	011110	Character not defined in Standards
63	?	0	011111	Stop Character (End Sentinel)
64	@	0	100000	Character not defined in Standards
65	A	1	100001	
66	B	1	100010	
67	C	0	100011	
68	D	1	100100	
69	E	0	100101	
70	F	0	100110	
71	G	1	100111	
72	H	1	101000	
73	I	0	101001	
74	J	0	101010	
75	K	1	101011	
76	L	0	101100	
77	M	1	101101	
78	N	1	101110	
79	O	0	101111	
80	P	1	110000	
81	Q	0	110001	

ASCII	Character	Parity	Magcode	
82	R	0	110010	
83	S	1	110011	
84	T	0	110100	
85	U	1	110101	
86	V	1	110110	
87	W	0	110111	
88	X	0	111000	
89	Y	1	111001	
90	Z	1	111010	
91	[	0	111011	Character not defined in Standards
92	\	1	111100	Character not defined in Standards
93	]	0	111101	Character not defined in Standards
94	^	0	111110	Field Separator
95	_	1	111111	Character not defined in Standards

Mag Code = the six LSB of (ASCII value - 32), parity bit is added by printer.

TRACK 2&3 ISO ENCODING

ASCII	Character	Parity	Magcode	
48	0	1	0000	
49	1	0	0001	
50	2	0	0010	
51	3	1	0011	
52	4	0	0100	
53	5	1	0101	
54	6	1	0110	
55	7	0	0111	
56	8	0	1000	
57	9	1	1001	
58	:	1	1010	Account Separator (Track 3 only)
59	;	0	1011	Start Character (Start Sentinel)
60	<	1	1100	
61	=	0	1101	Field Separator
62	>	0	1110	
63	?	1	1111	Stop Character (End Sentinel)

Mag Code = the four LSB of (ASCII value - 48), parity bit is added by printer.

Sending !M 12345 to the printer results in encoding of 00000;12345?000000

This results in:

000000000000000000000000000000001011000100100011010001011111

on the stripe.

4.6.11 Storage commands

!H P n1 n2

21 48 20 50 20 n1...n2	hex
33 72 32 80 32 n1...n2	decimal

Set Parameter Value

A number of bytes in the flash PROM hold various parameter values called *default parameters*. One or several of them can be overridden temporarily with this command.

n1 Parameter number as decimal digit(s)

n2 Parameter value

A space must separate the parameter number and the parameter value

See “Default parameter settings” on page 25.

The permanently stored parameters will be used again after a printer-reset command or at power ON.

The temporary values can, however, be stored in the flash PROM as permanent values with command !H S.

EXAMPLE:

!H P 1 11<CR><LF> sets parameter 1 (baudrate) to 115200 bps.

!H S

21 48 20 53	Hex
33 72 32 83	decimal

Store current Parameter Values

Stores the current setting of all parameter values in the setting memory. These parameters are then used as default parameters. Storing takes approximately 4 seconds. The printer activates the cutter to indicate that storing is complete.

!S P n1 n2

21 53 20 50 20 n1	Hex
33 83 32 80 32 n1	Decimal

Parameter-setting data Enquiry

This command requests information about the setting of parameter n1. The reply is the parameter value stored in flash PROM or any parameter value temporarily set by other commands.

n1 Parameter number to start from, as decimal digit(s)

n2 Number of parameters to read out

The parameter names are listed on page 59.

EXAMPLE:

!S P 1 1<CR><LF>	Recalls the setting of parameter 1 (baudrate)
!S P 1 4<CR><LF>	Recalls the setting of parameter 1 to 4
!S P<CR><LF>	Recalls the setting of all parameters
!S P 0 1<CR><LF>	Parameter number 0 reflects the No. of parameters stored in the printer. So If you send !S P 0 1 to the printer and get a 14 as reply you know that there are 14 parameters that you can read out.

- Parameter number 255 contains a checksum calculated as the sum of all parameters from parameter 1 to the parameter number given by parameter 0.

!H F

21 48 20 53	Hex
33 72 32 83	decimal

Load firmware

A utility program for loading firmware is available on the Swecoin web site (The TTP Editor). If you want to make remote upgrading of firmware possible though your ticketing system you should implement the **!H F** command.

EXAMPLE:

!C<CR><LF>	Prepares the printer for incoming data
!H F<CR><LF>	Tells the printer that the binary to come is a firmware file
Delay 100 ms	Here you should have a delay of 100 ms before sending the firmware file to the printer port.
Binary file	Firmware file with the version you intend to upgrade to.

After burning the new firmware into the Flash PROM, the printer will make a reset.

!H C		
21 48 20 43	Hex	Load character set (font)
33 72 32 67	decimal	

Loads and stores an SWF-font into the flash prom of the TTPM3. A character set loaded gets the next free character set number. So character sets must be loaded in the order that you want them.

A utility program for loading character sets is available on the Swecoin web site (the TTP Editor). If you want to make remote upgrading of fonts possible through your ticketing system you should implement the !H c command.

EXAMPLE:

!C<CR><LF> Prepares the printer for incoming data

!H c<CR><LF> Tells the printer that the binary to come is a character set file

Delay 100 ms Here you should have a delay of 100 ms before sending the font file to the printer port.

Binary file SWF font file with the font you intend to load.

After burning the new character set into the Flash PROM, the printer will make a reset.

!H C E		
21 48 20 43	Hex	Erase all character sets (fonts)
33 72 32 67	decimal	

You cannot delete a single font from the printer but must delete all fonts and then load the fonts you want again.

The Swecoin TTP Editor can be used to erase fonts. If you want to make remote deleting of fonts possible through your ticketing system you should implement the !H c E command.

EXAMPLE:

!C<CR><LF> Prepares the printer for incoming data

!H c E<CR><LF> Erases all character set from the printer

After erasing the character sets, the printer will make a reset.

4.6.12 Font loading

The printer can store fonts in its flash PROM. The fonts are given font numbers when they are loaded into the printer. The first font is assigned number 0 and the next font 1 etc. up to font 3.

The memory available for font storage is printed on the self test ticket. The number of fonts that fit depends on the size of the font files.

You cannot erase a single font, but must erase all four fonts with `!H c E`, then reload the fonts you wanted to keep.

Utility software for generation of SWF-font files and loading/erasing fonts is available on the Swecoin web site. If you need to load fonts in a non-Windows environment, use the `!H c` command.

The time required for processing the font data that is loaded is typically 15–20 seconds per font, excluding transfer time. During this time, any data sent to the printer will be lost.

NOTE! — *The font processing ends with a reset.*

CAUTION! — *Loading to the flash PROM will erase the RAM completely since the RAM is used during the loading process. Any print data residing in RAM will thus be lost.*

4.6.13 Logotypes

Logotypes can be stored in the flash PROM of the printer and printed on demand. The memory available for logotype storage is printed on the self test ticket. The number of logotypes that fit depends on the size of the font files.

You position and print a logotype with the command `!F L`.

LOADING

Windows software that converts black and white BMP bitmap files to logotypes and load them into the printer is available on the Swecoin web site. If you need to load logotypes in a non-Windows environment, use the `!H L` command.

The time required by the printer to process logotype data, excluding transfer time from the PC, is typically 15 to 20 seconds, per logotype. During this time, any data sent to the printer will be lost.

ERASING

All logotypes are erased with the `!H L E` command.

CAUTION! — *Loading to the flash PROM will erase the RAM completely since the RAM is used during the loading process. Any print data residing in RAM will thus be lost.*

5 TICKET EXAMPLES

The command language will be explained in detail with the following examples.

NOTE! – *These examples work with a TTPM3 set up for single-entry. If your printer is set up for dual entries you must insert an entry selection command, !L1 or !L2, on a separate line before the !P command.*

Assume that you want to print a document with the following layout and the number 123456789 to be encoded on ISO track 2 (or center track).

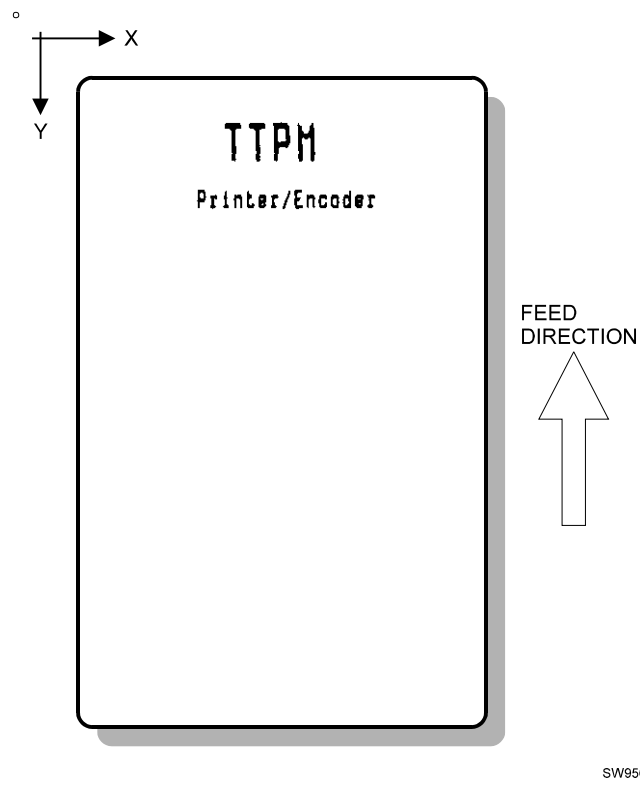


Figure 17. Printout example

To achieve this, the following data have to be sent to the printer:

```
!C
!C
!F T N 150 20 1 2 2 1 "TTPM"
!F T N 110 70 1 1 1 1 "Printer/Encoder"
!M 123456789
!P
```

This command sequence will now be fully explained:

!C Clears all previously sent definitions.

!F T N 150 20 1 2 2 1 "TPM"

Defines a print field starting at X coordinate 150, (pixel pos. 150), Y coordinate 20 (pixel pos. 20), with characters of double height and double width, font 1. X-axis resolution is 7.52 pixels/mm (0.133 mm/pixel), Y-axis resolution is 5.7 pixels/mm (0.175 mm/pixel)

!F T N 110 70 1 1 1 1 "Printer/Encoder"

Defines a print field at X pos. 110, Y pos. 70 with standard size characters, font 1.

!M 123456789

Defines data to be encoded in ISO defined format on ISO track 2 (or center track) magnetic stripe as "123456789". Reads the encoded string, compares with the input (read-after-write)

NOTE! – For ISO encoding, start, stop and check digits, as well as synchronization zeroes are automatically added by the TTPM3.

!P Encodes and prints the document

The "!" definitions are now stored in the printer. If another document with the same text and layout shall be printed but with another magnetic data string then only the following commands need be sent to the printer:

!M 987654321

!P This sequence will encode a ticket with a different number on the magnetic stripe but will produce a print picture with the same text and layout as the previous one.

NOTE! – If data shall be encoded on track 1 or 3, use the applicable command **!J** or **!K** to precede the data. The same Encoding/Read-after-Write routine applies as for track 2 (or center track) encoding.

Multiple tracks can be encoded in the same operation unless the printer uses HiCo tickets.

!J <message> and !K <message> for encoding track 1 or 3 shall precede the !M <message> and !N<message> for simultaneous encoding/read-after-write of message data on tracks 2 and 1/3.

NOTE! – X position range is 0–380 (at North orientation)
Y position range is 0–470 for 86 mm tickets (at North orientation)

We have so far been printing text oriented in the North direction. The printer is capable of printing in four directions.

NOTE! – Fonts 2 and 3 can only be printed in North orientation.

The following example prints text oriented in all four directions:

```
!C
!C
!F T N 120 190 1 1 1 1 "Prints"
!F T E 190 250 1 1 1 1 "In"
!F T S 170 350 1 1 1 1 "Four"
!F T W 120 330 1 1 1 1 "Directions"
!P
```

N = North
E = East
S = South
W = West

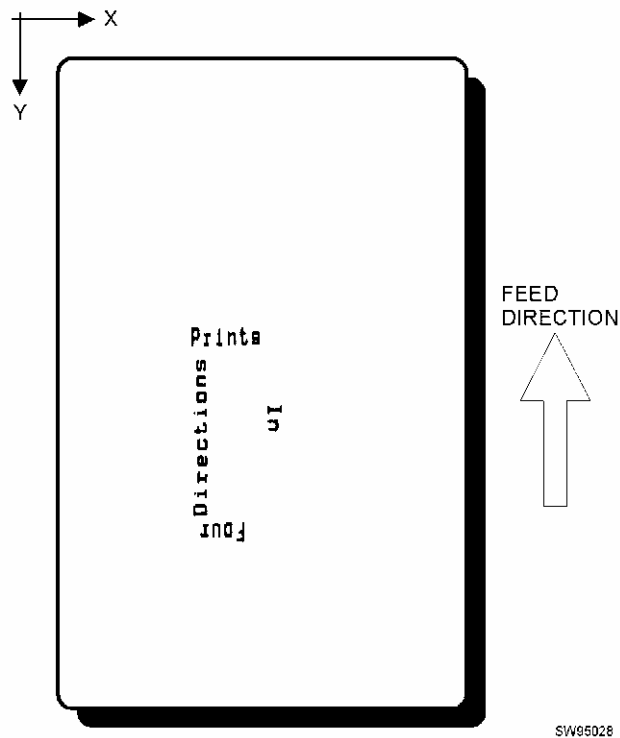


Figure 18. Printout example

Text attributes

TTPM3 does not handle word processor-like text attributes. You can reverse text, and you can make bold text according to the procedure described below. Bold and reversed cannot be combined.

5.1.1 Printing **Bold text**

Bold text is created by repeating the text you want bold, but with new coordinates:

```
!C
!C
!F T E 370 087 10 02 01 1 "This text is normal"
!F T E 309 087 10 02 01 1 "This text is bold"
!F T E 309 088 10 02 01 1 "This text is bold"
!P
```

You can increase the "boldness" by changing the coordinates more than one pixel, or by repeating the text more times with a shift also in the vertical direction.

5.1.2 Reversed text Reverse print

If an R character is appended to the font selection digit (no space between), the text is reversed.

```
!C
!C
!F T E 100 110 1 02 02 1R "Reversed text"
!F T E 200 110 1 02 02 1 "Normal text"
!P
```

NOTE 1! – Only print single words in reverse. Reversing a complete line may reset the printer due to the high current consumption when printing all black.

NOTE 2! – Reversed text work with fonts 1, 2, and 4.

6 DEFAULT PARAMETER SETTINGS

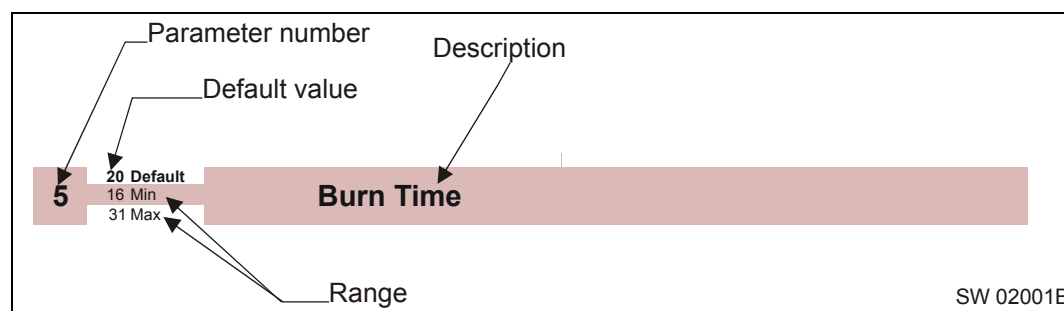
Some of the printer settings can be stored in non volatile memory so that they will be used also after power OFF.

Each parameter has a parameter number (n) used when setting the parameter with the command `!H P n v`.

Most parameter settings must be stored before being effective. Do this by setting them up and then send `!H s` to store all settings in the non volatile memory.

NOTE 1! – If you try to set a parameter to an invalid value, the parameter will be set to the nearest valid value below, except for the baud rate value which will return to the default value 115200 bps.

6.1 How the parameters are described



6.1.1 Default value

The default values indicated are "factory default settings" you get by following the procedure on the next page. These are not necessarily the settings that your printer was originally delivered with because many printers have customized settings when delivered.

6.1.2 Examples

Command examples are formatted in **Courier** and typed in the same way as used in the Swecoin TTP editor:

```
!H P 1 11<CR><LF>
```

Where `<CR>` means the carriage return character 12 decimal (hex 0C). Numbers between less-than and greater-than characters, for example `<001><015>`, means 1 and 15 decimal (hex 1 and 13).

6.2 Summary of parameter settings

Parameter	Description	Default	Page
1	Baud rate	11 (115200 Baud)	59
2	Flow control	2 (Hardware)	59
3	Printer type	2 (Two Consecutive)	59
4	Network Enable	0 (disabled)	60
5	Burn time	20	60
6	ACK/NAK + error code	1 (enabled)	60
7	Clear memory after print	0 (disabled)	60
8	Clear ticket path at startup	1 (enabled)	60
9	Mag-stripe verification read.	0 (Verify all)	61
10	Encode start speed	30	61
11	Encode full speed	450	61
12	Print start speed	100	62
13	Print full speed	400	62
14	Print Resolution	0 (Normal = 5.7dots/mm)	62
15	Encoding retries	3	62
16	Encoding attempts, No. of tickets	3	63
17	Beak feed length	50 mm	63
18	Feed to cut	22	63
19	Bit order for !B 1 command	1	63
20	Bit order for !B 2 command	1	63
21	Bit order for !B 3 command	1	63
31	Character sent after print	0 (disabled)	63
32	Long ticket length	94	64
33	Top margin short ticket	10	64
34	Fix ticket length	123	64
35	Feed after black mark in black mark mode	196	64
36	character pitch for font 1	12	64
37	Paper out behaviour	1 (keep data)	64
38	Steps after which the print motor is started for long tickets	280	
39	Feed to cut long tickets	27	

NOTE! – When the printer is set up the way you like it to be, you send:
!H S, and all settings will be stored.

6.2.1 Restore factory default

MANUALLY

1. Switch off the power
2. Hold the three front pushbuttons pressed while switching on the power
3. When the printer has started, release the buttons
4. Press and hold the Clear Jam button for 3 seconds

Now the printer will return to default settings above, or if the printer is customized, the settings agreed on with that customer.

REMOTE

The printer returns to factory default settings if you send:

`!H P 0 0<CR><LF>`

`!H S<CR><LF>`

`Power OFF/ON`

6.3 Parameter Reference

1 96 Default
11 Min
96 Max

Baud rate

Stores the communication speed on the serial interface.

!H P 1 12	1200 bps
!H P 1 24	2400 bps
!H P 1 48	4800 bps
!H P 1 96	9600 bps
!H P 1 19	19200 bps
!H P 1 38	38400 bps
!H P 1 57	57600 bps
!H P 1 11	115200 bps
!H P 1 23	230400 bps, not recommended
!H P 1 46	460800 bps, not recommended

NOTE 1! – If you set an invalid value, the baud rate will return to 115200 bps.

NOTE 2! – The new baud rate will not be valid until after the parameters are stored with the !H S command

2 2 Default
1 Min
2 Max

Flow-control

Select what handshaking to use on the serial interface.

!H P 2 1	Xon / Xoff ¹
!H P 2 2	Hardware

3 2 Default
1 Min
2 Max

Printer type

Select what handshaking to use on the serial interface.

!H P 3 1	Standard (One consecutive [lower entry] + handfed-tickets [upper entry])
!H P 3 2	DCT (Dual Consecutive entries)
!H P 3 3	Card dispenser
!H P 3 4	Fixed length, see parameter 34
!H P 3 5	Black mark mode, see parameter 36

NOTE! – Must not be set to DCT when front loading is used!

¹ DO NOT USE. If you send any type of binary data like graphics data, status requests etc. Xon / Xoff only work when plain text is sent unidirectional to the printer. Graphics and status replies may well contain the Xon (11h) and Xoff (13h) characters and will obstruct the communication.

4 0 Default
0 Min
1 Max

Network enable

Enables / Disables extra handshaking used by TCP/IP option

!H P 4 0 Network disabled

!H P 4 1 Network enabled

5 20 Default
16 Min
31 Max

Burn time

A long burn time gives darker print. On insensitive paper types you may have to increase the burn time to get an acceptable print quality.

!H P 5 27 Sets burn time 27

CAUTION! – A longer burn time put more load on the printhead, so do not use a longer burn time than required for a clearly legible print. Settings over 27 are not recommended.

6 1 Default
0 Min
1 Max

ACK/NAK + error code

For the host computer to get status back from the printer, ACK/NAK must be enabled.

!H P 6 0 Silent

!H P 6 1 Enabled

7 0 Default
0 Min
1 Max

Clear memory after print

When enabled the memory is cleared after each print so that no extra copies of a printout can be made.

!H P 7 1 Enables auto clear after print

8 1 Default
0 Min
1 Max

Clear ticket path at startup

When enabled the printer looks for tickets in the printer at power on and voids any ticket found.

!H P 8 1 Enables auto clear at startup

9

0	Default
0	Min
1	Max

Verify encoding

When enabled the data encoded to the selected tracks are verified by the printer before the ticket is issued.

Tracks: 123 You enable verification of a track by setting the bit for that track to 1.

!H P 9 111 Enables Verification of tracks 1, 2, and 3

!H P 9 110 Enables Verification of tracks 1 and 2

!H P 9 011 Enables Verification of tracks 2 and 3

!H P 9 010 Enables Verification of track 2

!H P 9 000 Disables verification of all tracks

NOTE! – Always disable verification on the tracks not covered by the magnetic stripe on the tickets used in the application. For example if you only use track 2, set P9 to 010. This controls the self test of the printer. If erroneously set, all self test tickets may be voided.

10

30	Default
0	Min
999	Max

Encoding start speed

Sets the speed at which the stepper motor starts to accelerate. Normally you never have to change this setting.

10=100 steps/s

...

30=300 steps/second

300 steps/s gives 30 mm/s

!H P 10 40 Sets 400 steps/second

NOTE! — Some settings result in printer chassis resonance causing increased noise and deteriorated print quality

11

450	Default
1	Min
999	Max

Encoding full speed

1=1000 steps/s

...

450=4500 steps/second

1000 steps/s gives 100 mm/s

!H P 11 400 Sets 4000 steps/second

NOTE1! — Some settings result in printer chassis resonance causing increased noise and deteriorated print quality

NOTE2! — When long tickets are used the encoding speed must be reduced to 350

12100 Default
0 Min
999 Max**Print start speed**

Sets the speed at which the stepper motor starts to accelerate. Normally you never have to change this setting.

10=100 steps/s

...

160=1600 steps/second

With normal resolution, 1000 steps/s gives 50 mm/s

!H P 12 100 Sets 1000 steps/second

NOTE! — Some settings result in printer chassis resonance causing increased noise and deteriorated print quality

13400 Default
0 Min
999 Max**Print full speed**

The print speed together with burn time is used to set print quality. Experiment with these settings to get the most readable bar-codes and text on your ticket material.

1=1000 half-steps/s

...

16=1600 half-steps/second

With normal resolution, 2000 half-steps/s gives 100 mm/s

!H P 13 300 Sets 3000 half-steps/second

NOTE1! — Some settings result in printer chassis resonance causing increased noise and deteriorated print quality

NOTE2! — When long tickets are used the encoding speed must be reduced to 300

14400 Default
0 Min
999 Max**Print resolution**

This command sets the resolution of the print. This only affects the resolution in the transport direction of the ticket.

!H P 14 0 normal resolution, (5.7dots/mm).

!H P 14 1 high resolution (8.5 dots/mm).

153 Default
0 Min
10 Max**Encoding retries**

Sets how many times a ticket should be encoded/verified before being erased and voided when the verification fails.

!H P 15 5 Makes five encoding attempts per ticket before giving up and erasing and voiding the ticket.

NOTE! — See also !P

16 **3** Default
0 Min
10 Max

Encoding attempts, No. of tickets

Attempts are the number of tickets the TTPM3 should attempt to encode when verification fails. If set to 1, one ticket is encoded and if verification fails the stripe is erased, VOID printer on the ticket and an error code sent to the system.

!H P 16 2 Two tickets will be used before giving up.

NOTE! — See also **!F M**

17 **50** Default
1 Min
250 Max

Beak feed length

Determines how far the ticket should be fed out after the last pixel line is printed.

18 **22** Default
1 Min
50 Max

Cut position (Short tickets)

Determines how far the ticket should be fed from when the sensor before the cutter sees the trailing edge, and the ticket is being cut. One step is 0.4 mm.

19 **1** Default
0 Min
1 Max

Bit order for !B 1

1 means normal bit order, and 0 means reversed bit order for binary encoding of track 1 using the **!B 1** command.

Normal means that a hex nibble 01h is encoded as 0001 (seen from the edge of the ticket that enters first when feeding in a ticket from the rear entries).

Reversed means that the same nibble is encoded as 1000.

!H P 19 0 Reverses the bit order on track 1.

20 **1** Default
0 Min
1 Max

Bit order for !B 2

1 means normal bit order, and 0 means reversed bit order for binary encoding of track 2 using the **!B 2** command.

21 **1** Default
0 Min
1 Max

Bit order for !B 3

1 means normal bit order, and 0 means reversed bit order for binary encoding of track 3 using the **!B 3** command.

31 **0** Default
32 Min
255 Max

Character sent after print

An ASCII character can be returned to the host after a completed ticket generation.

!H P 31 3 The character 03h (ETX) will be sent by TTPM when the last pixel line of the ticket has been printed.

32 **94** **Default**
 0 **Min**
 255 **Max**

Long ticket length

This parameter adjusts the transition between short and long ticket.

CAUTION! — *Do not change unless you are told by Swecoin Technical Support to do so.*

33 **10** **Default**
 0 **Min**
 255 **Max**

Top Margin, short ticket

The start of print is measured from the rear edge of the ticket and this parameter can be used to adjust the start of print.

34 **123** **Default**
 32 **Min**
 255 **Max**

Fixed ticket length

Length of ticket in fixed length mode. Fix length means that there is no gaps or black marks to control cut. The printer counts steps from the leading edge of the ticket and cuts when fed to the setting of this parameter.

35 **196** **Default**
 32 **Min**
 255 **Max**

Feed after black mark in black mark mode

The printer counts steps from the middle of the black mark, and cuts when fed to the setting of this parameter.

36 **12** **Default**
 1 **Min**
 16 **Max**

Character pitch for font 1

This parameter is used if the width parameter in the `!F` command is set to 1.

NOTE! — *See also !F T*

37 **1** **Default**
 0 **Min**
 1 **Max**

Paper out behaviour

The printer sends NAK P when a `!P` is received and the printer is out of paper. This parameter decides what the printer should do with ticket data when out of paper.

`!H P 37 0` The printer discards all data until paper is loaded.

`!H P 37 1` The printer waits for paper to be loaded and then print the ticket from memory

38 **280** **Default**
 0 **Min**
 400 **Max**

Steps after which the print motor is started for long tickets

If long tickets are used, the print motor must start before the ticket is cut. This parameter sets when to start the print motor. One step is 0.4 mm.

39 **27** **Default**
 0 **Min**
 100 **Max**

Cut position (Long tickets)

Determines how far the ticket should be fed from when the TOF sensor sees the trailing edge, and the ticket is being cut. One step is 0.4 mm.

7

ERROR CODES AND STATUS REPORTING

The host computer uses the TTPM3 status reporting to determine if the print cycle has been completed or not. If not, error codes help determine what went wrong.

7.1 Status

When executing the print command **!P**, the printer confirms that the magnetic code is has been written and verified by sending an **"ACK"** (06H) to the host. This indicates that the ticket is almost ready and should just pass the printhead and be outputted to the customer. You can extend the acknowledge procedure to send acknowledge for other things than magnetic encoding. See command **!C A**.

If you select a character by setting parameter 31, that character will be sent when the when the print cycle is completed, which is when the ticket leaves the printhead. At this stage you can be reasonably certain that the ticket has been correctly issued, and you can proceed with the next ticket.

You can at any time¹ read the sensors in the printer with the **"ENQ"** (05H), and **!S** commands. See page 30.

7.2 Security additions

Status reporting is used as a security measure to ensure that no manipulation has occurred that makes it possible to issue more tickets than intended.

1. If "Auto Clear at Startup" is enabled (parameter 8) the printer it looks for any unfinished ticket, voids it, and then issues an **NAK G** error code to inform about this.
2. If "Character sent after print" is selected (parameter 31) the printer issues that character, for example **ETX** (03H), to tell that the print cycle has been completed.
3. A transaction string can be appended to the ticket data using the **!Q** command. The string is stored in nonvolatile memory when the 03H is issued. This string can be read by the **!V** command, but there is no way to change the string other than issuing a new ticket.
4. During printing, a byte-counter is incremented and stored in the RAM. The counter starts at zero, and when the ticket is ready the counter has reached 5BE0h, which is 23520.

Dividing the byte counter value by the number of pixels on a line (384) gives the current pixel line. When the ticket is completed, we have printed $\frac{23520}{384} = 61.25$ bytes of pixel lines in the y-direction. $61.25 \times 8 = 490$ pixel lines. You have 5.7 pixel lines/mm. $\frac{490}{5.7} = 86$ mm which is one ticket length.

Should a power failure occur, before the counter reaches the full value (5BE0h) you can analyze the counter value to see if the ticket was as ready enough to pass as a

¹ After a power off, the printer must first receive a **!C** or **!P** before answering status queries.

usable ticket. In such case you should not issue a new ticket unless you get the **NAK G** that shows that the almost ready ticket has been voided.

5. A critical error status message informs the host computer if something happens in the printer that requires the operator to power it off.

7.3 Errors

TTPM3 reports error conditions in the form of error codes. An error condition is reported as a **NAK** (15H) followed by a one-character error code. The error codes have been defined, starting with ASCII character "1" (31H) according to the following table:

"1"	No paper in the entry path selected with !L1, !L2, !L17, or !L18.
"2"	Paper jam when executing !L1, !L2, !L17, or !L18.
"3"	Reserved.
"4"	Cutter error. No full cut performed. Cutter blade returned to home position by reversing the cutter motor.
"5"	Cutter error. Cutter blade not returned to home position.
"6"	Cutter error. Cutter blade not moving. If this error code is received immediately after power ON, it indicates that something is wrong with the +24V supply.
"7"	Paper jam when executing the !P command.
"8"	Magnetic encoding on track 2 (or center track) failed.
"9"	Magnetic encoding on track 1 or 3 failed.
"A"	Not possible to read magnetic information with !D, !D1, !D2, or !D3 commands.
"B"	No document inserted within time limit following an !L3 command (front load).
"C"	Document inserted (front load) but immediately retracted.
"D"	Document inserted through front load is blocked.
"E"	Document blocked in the front load input feeder during an !L3 command. Also used when combining the characters | and } in a hex magnetic string to get normal behavior if the encoding was successful. If an error occurs then the ticket is transported back to the start position and NAK E is sent.
"G"	Document found in the ticket path during power on has been erased, VOID-printed and ejected.
"P"	If !P is sent to the printer and paper is out, it replies with NAK P and discards data.
"X"	Critical error. This is issued when the printer must be turned off, error condition cleared, then turned off again.

NOTE! – For TTPM3 to send ACK, or NAK + error codes, the DIP-switch 6 on the TTPM3 control board must be set to ON. Position OFF places the unit in a silent mode preventing these codes from being transmitted to the host computer.

7.4 Extended acknowledgement

It is possible to extend the acknowledgement procedure so that most commands are acknowledged by the printer.

To enable the function you have to send the command:

!CA

A ticket should therefore always start with the commands:

!C

!CA

The extended acknowledgement is a command number appended to the ACK. The command number is a 1 byte hexadecimal number according to the following table.

Command	Acknowledgement		When?
	Normal	Extended	
!P	06h	06h 80h 06h 02h	After a successful magnetic encoding. After printing.
!C		06h 04h	After clear memory
!F		06h 05h	After formatting data in memory
!L		06h 08h	After successful track load / eject operation
!L 17	06h	06h 08h	When the lower input contains ticket stock
!L 18	06h	06h 08h	When the upper input contains ticket stock
!L 3	06h	06h 08h	When a ticket has successfully been loaded from the front to the upper input track.
!L 4	06h	06h 08h	When successful eject through front entry
!E		06h 09h	After successful eject through rear entry
!Q		06h 14h	After transaction string is written in memory
!Z		06h 18h	After burn time is changed
!X		06h 19h	After changed resolution

The following is a simple example:

Sent to printer	Acknowledgement
!C	06h 04h
!C A	06h 04h
!F T E 309 014 10 03 02 1 "TEST TICKET WITH FULL"	06h 05h
!F T E 259 024 10 03 02 1 "75 BPI TRACK 2 STRING"	06h 05h
!M 1234567890123456789012345678901234567	06h 80h
!P	06h 02h

8

MAINTENANCE**8.1 Fault finding**

In connection with service of the printer it is good practice to remove paper dust and lint from the paper path, cutter and sensor areas. Paper dust, when accumulated, may interfere with printer functions such as optical sensors.

To avoid smudging the paper, do not apply oil on the cutting knife.

Symptom	Suggested actions
Nothing is printed when you press the feed button in self-test mode, but the document is transported, cut and ejected.	<ul style="list-style-type: none"> • Check that the paper roll is turned the correct way with thermal sensitive layer facing up. • Check that the paper used meets the paper • Check that the printhead cable is fully inserted into the connectors at each end.
Paper jam	<ul style="list-style-type: none"> • Check cutter-home sensor.
Printer does not work at all	<ul style="list-style-type: none"> • Check that the printhead is closed. • Check that power is supplied to the printer. • Check the function of the paper-out sensor.
Self-test prints OK, but the printer works strangely in normal operation.	<ul style="list-style-type: none"> • Check that both ends of the interface cable are properly connected. • Application program might be incorrect. Contact system manager.
No cutting	<ul style="list-style-type: none"> • Check that the connector for the cutting motor is fully seated on the control board.
Bad cutting (uneven top and bottom document edges).	<ul style="list-style-type: none"> • Switch OFF printer and remove any obstructing paper particles in cutter and presenter modules.
Inconsistent cutter operation	<ul style="list-style-type: none"> • Check/clean cutter-home sensor.
Paper is fed straight through the printer. Paper does not loop.	<ul style="list-style-type: none"> • Check/clean presenter sensor. • Check setting of parameter p9.
Missing print or irregular spots.	<ul style="list-style-type: none"> • Paper may be too humid. Let it adapt to ambient temperature and humidity for approximately 24 hours before use. • The paper used might not meet the paper specification.
White longitudinal lines in the printout.	<ul style="list-style-type: none"> • Faulty print head, replace.
Faint print.	<ul style="list-style-type: none"> • The paper used might not meet the paper specification. • Clean print head with ethyl or isopropyl alcohol. • Adjust print contrast, see page 60.
Strange characters or graphics printed, or any kind of strange printer behavior.	<ul style="list-style-type: none"> • Might be caused by erroneous data sent from the host. Check validity of transferred data.

Table 2. Faultfinding

8.2 Cleaning the print head

The print head can be cleaned without removal.

1. Open the printhead.
2. Clean the heat elements with a cotton swab immersed in ethyl or isopropyl alcohol.

8.3 Firmware

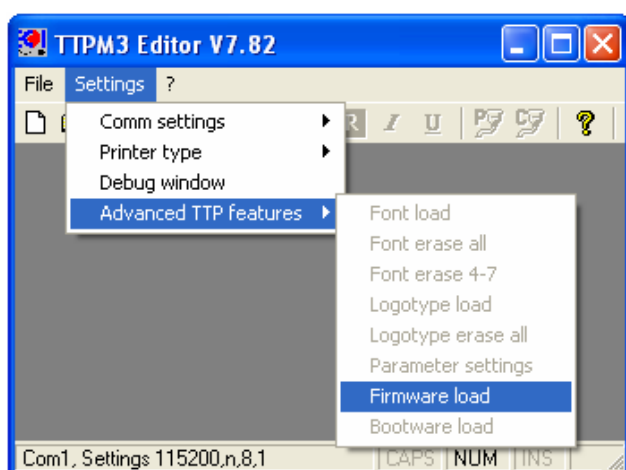
The firmware is stored in flash-PROM on the control board. A replacement control board may not contain the same firmware version that you are currently using, so if you replace control board for some reason, upgrade it to the firmware version you want to use.

8.3.1 Loading

Firmware is loaded through the serial port of the TTPM3.

Fetch the firmware from the Swecoin web site <http://www.swecoin.se>. There you will also find the TTP Editor (Windows™ software) you use for loading the firmware into the printer.

1. Start the TTP Editor and select settings, Printer type TTPM3, and set the Comm settings to the port etc. that you use.
2. Select Settings, Debug Window, and click on "Text".
3. Move the debug window so it does not cover the TTP editor. (The debug window will show status during program loading and must be open)
4. Select Advanced TTP features, and firmware load, and follow the instructions on the screen.



NOTE! — The connector that must be short circuited with a jumper during program loading is located close to the power connector. If you have a desktop version of the TTPM3, a hole in the bottom of the cover gives access for the jumper.

9

SPECIFICATIONS

Specification subject to changes without notice.

9.1 Interface description

The TTPM3 communicates through an RS232 serial interface.

9.1.1 Setup options

Baud: 2 400, 4 800, 9 600, 19 200, 38 400, 57 600, and **115 200** bits/s
 Flow control: None, Xon / Xoff, or **Hardware**
 Data bits: 8 (fixed)
 Stop bits: 1 (fixed)
 Parity: **None**, Odd, or Even

Default settings: 115200 bits/s, 8-bits, No parity, 1 stop bit, and hardware flow control.

See also: Default parameter settings on page 25

9.1.2 Communications protocol

The protocol is 8 data bits, 1 stop bit, and no parity. Handshaking is DIP-switch-selectable, either or RTS/CTS or XON/XOFF (parameter n4).

Recommendation – Use RTS/CTS hardware handshake (parameter n4=2) and ACK/NAK + error code enabled (parameter n5=0)

9.1.3 Communications cable

Use a 9-pin serial cable to connect the TTPM3 printer to the host computer.

Such a cable is available from Swecoin. Part number 10825-000. The cable is 1.5 m long with 9-pole D-sub connectors at both ends (PC and TTPM3).

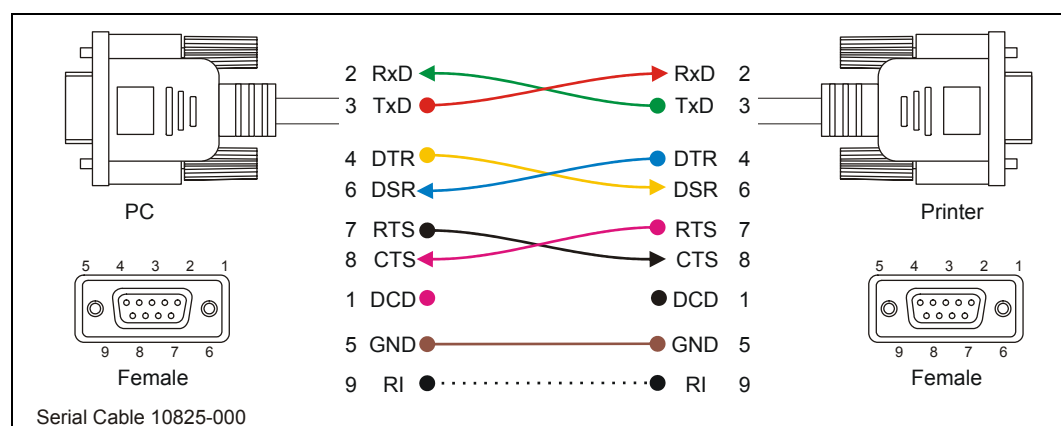


Figure 3. Serial connector pin assignment

NOTE! — This cable is **not** connected as a standard null-modem cable. So we recommend you to use the original cable from Swecoin or manufacture a cable according to the above drawing. If you use a null-modem cable, you will lose data in the transfer to the printer.

9.2 Document stock

The TTPM3 printers are produced and calibrated for, and tested with the customer's ticket stock. To ensure accurate ticket issuing, we do require 100 tickets of the customer ticket stock for each ordered printer.

9.2.1 Ticket base material

Type of paper	Ricoh 150UT 240 μ , Mitsubishi TF 2475, and Tyco Sharkskin are recommended. See www.swecoin.se for current recommendation.
Material	Paper, 100 % chemical pulp, no ground wood permitted Triplex ¹ laminate ² Plastic (polypropylene Sharkskin TM)
Stiffness	18–36 g/cm (in grain direction)
Thickness	Paper and laminate: 0.18–0.40 ³ mm, 170–210 g/m ² Plastic (polypropylene Sharkskin TM): 0.18–0.25 mm Factory setting: Set to the customer's tickets. A minimum of 100 tickets per printer ordered must be sent to Swecoin when ordering printers.
Curl	Deviation from flatness < 0.6 mm across the length, width, or diagonal of the ticket

9.2.2 Coating and preprint

Thermal coating	Shall meet or exceed the ANSI 3.11 specification Smoothness: Max. 75 Sheffield units Properties: Same as fax grade 3
Top coating	The thermo-sensitive surface of the document stock can be provided with a protective UV or moisture proofing top coating
Preprint	Tickets can be preprinted on one, or both sides. Ink for thermo-sensitive side: Laser printer approved ink without whiteners Ink for magnetic stripe side: Offset ink

CAUTION! – *Never use abrasive inks as they reduce the life of the thermal print head.*

¹ Triplex is manufactured from three paper stocks. The middle is usually recycled paper, and the top and bottom are different papers.

² Laminate with plastic core may destroy the printhead! DO NOT USE.

The perforation of the tickets may leave parts of the plastic core protruding through the surface of the ticket. These plastic tongues may scratch the printhead, and also build up static electricity discharging through the printhead. This may seriously limit the printhead life.

If plastic laminate still is used, care must be taken in the manufacturing process to avoid the plastic protrusion, and the printer must be life-tested with the intended stock before taken into use.

³ 0.18-0.32 mm for Frontload 1 and Frontload 2 versions of the printer

Thermal-print to preprint alignment

Tolerances in the printer, and in the ticket stock itself, can cause misalignment between the preprint of the ticket stock and the thermal print. The ticket guides in the printer are set at 54.3 mm. Narrower guides would cause paper jam when the relative humidity changes the ticket width.

A ticket width of 54.0 ± 0.2 mm gives a maximum misalignment of 0.55 mm ($54.3 + 0.05 - (53.3 - 0.2)$).

HINT! – Avoid designing tickets that require close alignment between preprint and thermal print.

9.2.3 Magnetic media

Magnetic stripe Side stripe positioned according to ISO 7811/2

Center stripe (option)

Magnetic media Full tape, transfer tape or slurry

CAUTION! – In case of slurry, care must be taken to avoid excess slurry material and abrasive particles that may cause unduly high degree of wear on the magnetic recording and read heads in the TTPM3

Coercivity Adjustable between 300 and 3500 Oersted

Factory set to: LoCo: 300 Oersted

HiCo: 2750 Oersted (option)

Non-standard coercivity setting available on request

If a ticket is perforated, for stub separation for example, the perforation shall not infringe on the magnetic track to prevent interference with magnetically encoded data.

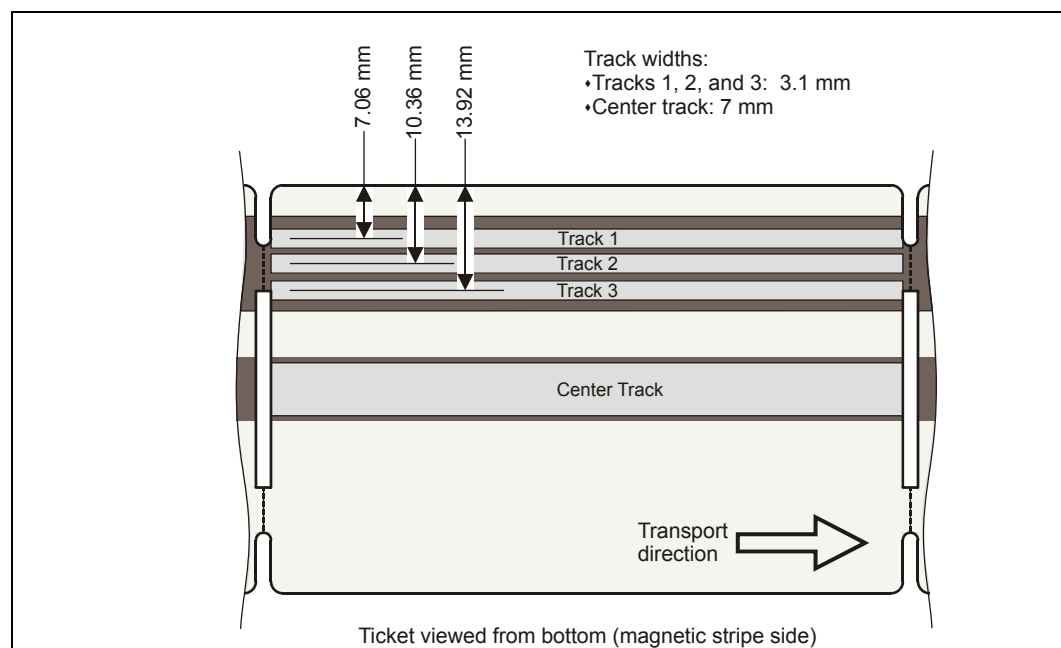


Figure 19. Position of the magnetic stripe.

9.2.4 Ticket dimensions and perforation

NOTE! — ISO No. 7810 says that “all points on the edges of the card in the finished state, except for the rounded corners, shall fall between two concentric, similarly aligned rectangles which are dimensioned as follows:

- Outer rectangle: width 85.72 mm, height 54.03 mm
- Inner rectangle: width 85.47 mm, height 53.92 mm”

Remember these measurements when ordering tickets to be sure that they work in any ISO 7810 compliant equipment.

Stock format	Fanfold ¹ gapped or non-gapped consecutive form tickets. Sheet-cut (single) tickets for manual or dispenser loading.
Perforation cut direction	Perforation and cutting of ticket material must be done from the thermally sensitive side of the paper.
TTPM3 accepted sizes:	
- Ticket width	54 mm ± 0.2 mm ²
- Ticket length	85.6 ± 0.25 mm, or 110 -150 mm
- Corner radius	3.18 mm ± 0.30 mm (0.125" ± 0.012 ") (preferably without minus tolerance). Care should be taken to avoid misalignment between the rounded corners and the straight edges of the card. The corner radius is for optical detection of top-of form.
Card edges	Edge burrs normal to the card face shall not exceed 0.08 mm (0.003") above the card surface.

¹ On request, versions for roll paper can be built. Requires testing with customer paper.

² When the width of the ticket exceeds 54.10 mm, machine reading problems may occur.

Gapped tickets

Two bridges according to Figure 20.

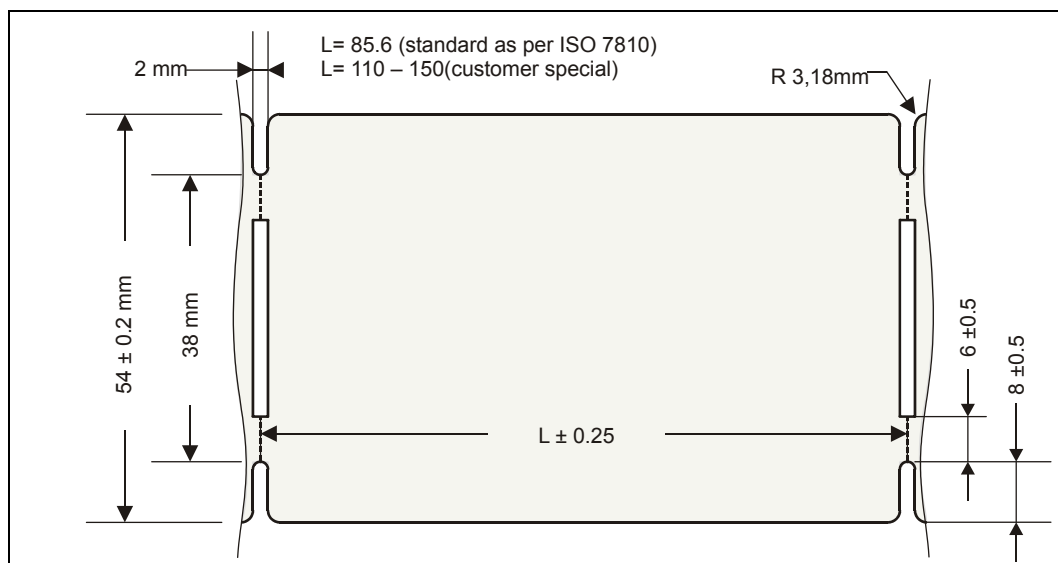


Figure 20. Gapped tickets

Non-gapped tickets

Equal distance between tabs according to Figure 21.

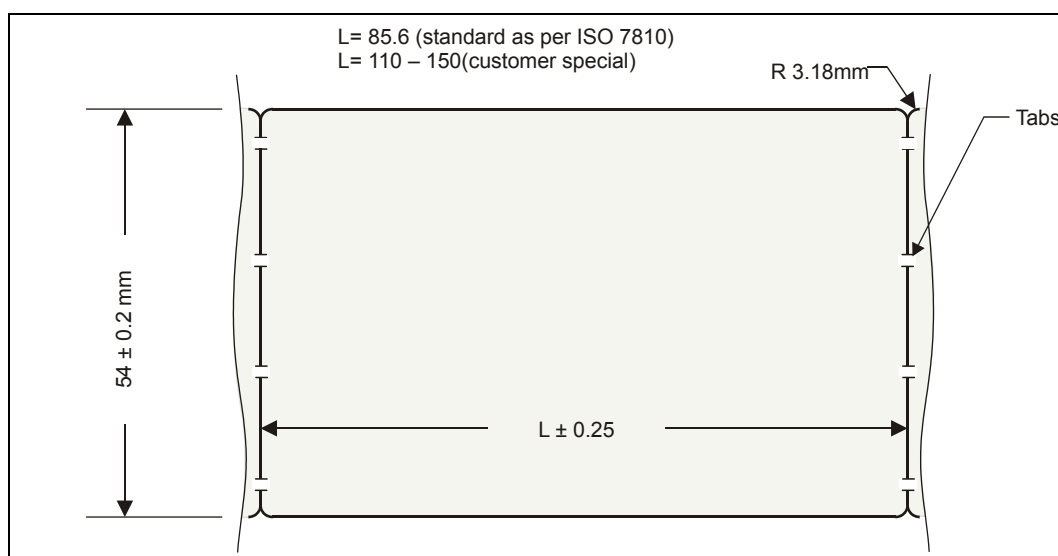


Figure 21. Non gapped tickets (for printers with burst separator)

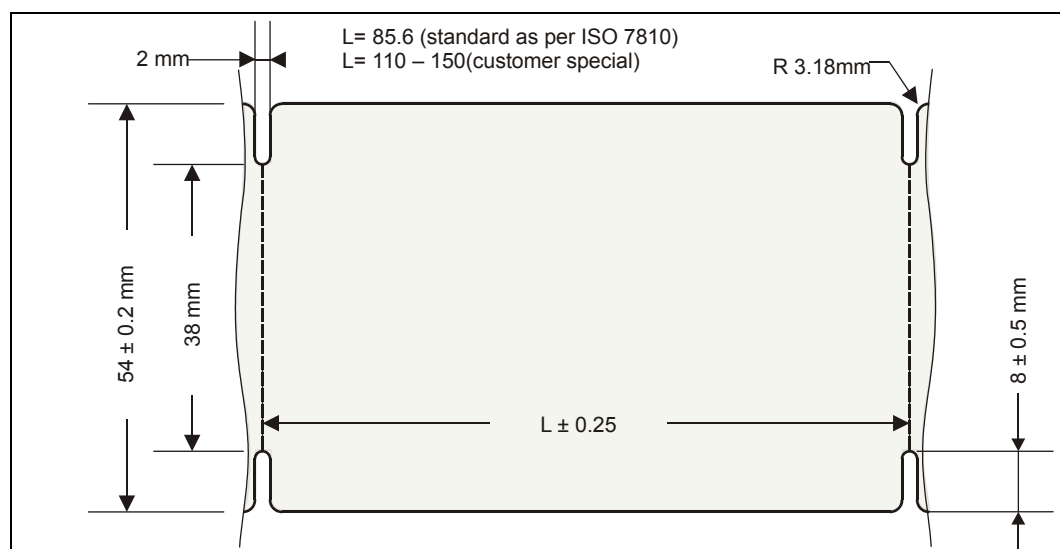


Figure 22. Alternative non-gapped ticket profile.

Perforation for stub

Placed at the trailing end of the ticket

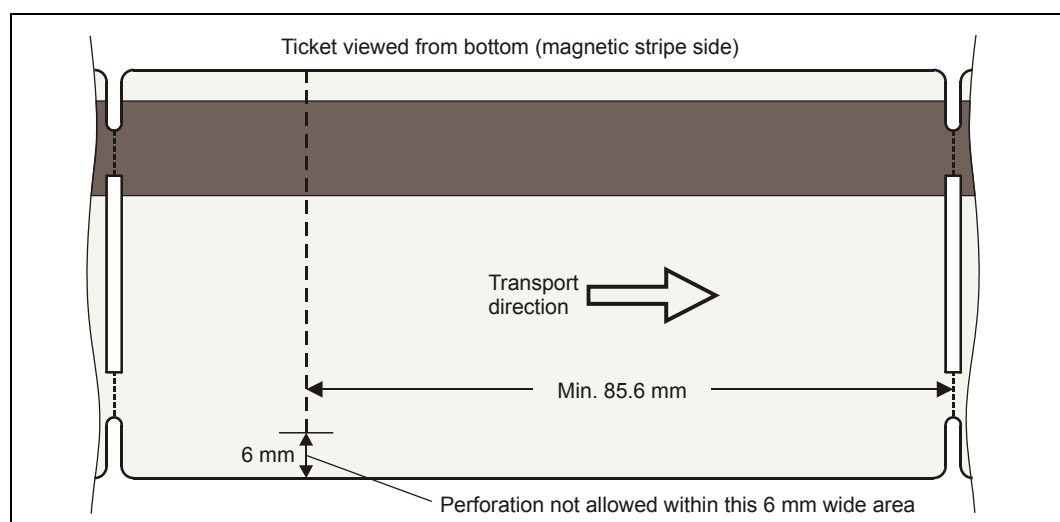


Figure 23. Stub perforation to create a tear-off tab.

TICKETS WITH 45° CUT CORNERS

Some applications are using tickets with cut corners without radius. These tickets are not within the specifications for use in the TTPM3 printer series. The effect will be that the ticket detection point moves about 1.3 mm, not only causing incorrect cut but also erroneous placement of the magnetic code.

The coding starts 1.3 mm too early resulting in synchronization zeroes being lost in the beginning of the ticket. On units configured for center track, the ticket should be readable in both directions. If synchronization is lost, the tickets will be readable if inserted one way, but not the other way around.

A solution to this problem is using HEX code for the magnetic message instead of ISO code. Thus you can compensate for the lost synchronization zeroes by adding additional

synchronization zeroes in the beginning of the message. However, note that HEX encoded tickets are normally not readable in standard ISO-card readers.

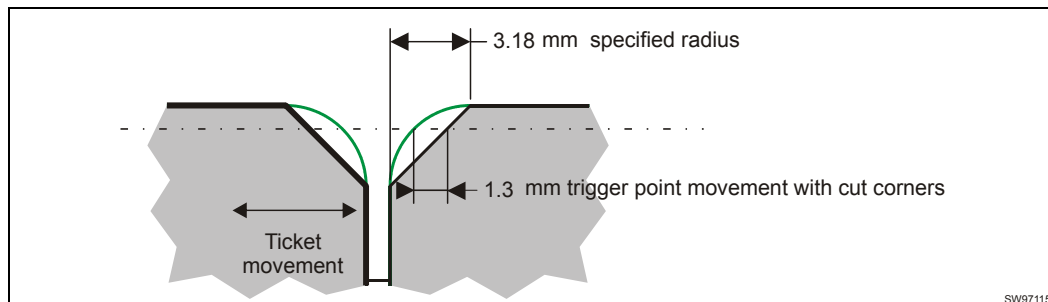


Figure 24. Ticket position is erroneously detected with 45° corners

9.3 Firmware

The firmware is stored in flash-PROM on the control board. A replacement control board may not contain the same firmware version that you are currently using, so if you replace control board for some reason, upgrade it to the firmware version you want to use.

Fetch the firmware from the Swecoin web site <http://www.swecoin.se>. Instructions how to load firmware using the Swecoin TTP Editor are bundled with the firmware.

Should you wish to integrate firmware loading into your own system, please read the “89c420 User Guide” available for download from www.maxim-ic.com.

9.3.1 Firmware versions

FW Version	TTPM2	TTPM3
Standard version, 3 track magnetic module	-	30953-XXX
Standard version, 2 track magnetic module	00906-XXX	30906-XXX
Standard version with POWER ON CLEAR	00946-XXX	¹⁶
Hebrew	01661-XXX	31661-XXX
FL and 2 inputs	01741-XXX	¹
Cyrillic	01751-XXX	31751-XXX
No cutter	01785-XXX	31785-XXX
161BPI Track 2 only	01789-XXX	31789-XXX
105BPI track 2 only	01790-XXX	31790-XXX
No encoding	01794-XXX	31794-XXX
No black mark and no gap	01805-XXX	31805-XXX

¹⁶ Selected with parameters in standard firmware

9.3.2 Firmware history

Functions and features are being added from time to time affecting the firmware in the TTPM3. The following table lists the changes of general interest.

FW revision	Change
4.60	First firmware version released to a customer

10 INDEX

A		E		M	
ACK/NAK.....	22, 32, 64, 65	EAN13.....	39	Magnetic codes.....	21
B		Eject document		Magnetic encoding	
Bar-code.....	21, 38	Into waste bin.....	33	Attributes.....	44
Baud rate.....	58	Via front document		Commands.....	26, 42
BMP-files.....	37	entry.....	33	Failure.....	65
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Checksum.....	44	Firmware history.....	75	coating.....	70
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Coercivity.....	71	loading.....	50	NAK 1.....	65
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Command syntax.....	20	position, orientation.....	34	NAK 6.....	65
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Communications		Data.....	36	NAK X.....	65
protocol.....	69	Ground.....	7	No document inserted.....	65
Converting graphics.....	37			No paper.....	65
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